DEVELOPMENT AND VALIDATION OF A REAL-TIME PCR ASSAY FOR BIOFORENSIC DETECTION OF *PSEUDOMONAS SYRINGAE* PV. *TOMATO* AND EVALUATING THE IMPACTS OF STRESSORS ON THE EFFECTIVENESS OF MULTIPLE-LOCUS VARIABLE NUMBER TANDEM REPEAT ANALYSIS (MLVA) AND MULTILOCUS SEQUENCE TYPING (MLST) IN MICROBIAL FORENSICS INVESTIGATIONS

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CHAPTER I

INTRODUCTION

National security reports suggest that the U.S. is vulnerable to biological attack in a variety of agricultural sectors including food production, food processing, and food distribution systems (Harl, 2002). To increase preparedness for investigation of such attacks, a national capability in microbial forensics is needed. Forensic detection assays must be developed and validated for use with animal and plant pathogens, as well as environmental samples of the type that may be associated with agricultural settings (Fletcher et al., 2006).

There is also concern that the lack of monitoring in most U.S. cropping systems may result in long lag periods between the time that a pathogen is introduced and the discovery of the ensuing disease (Madden and Wheelis, 2003; Nutter and Madden, 2009). Such lag periods may provide ample time for the pathogen to undergo evolutionary change within regions of the genome that are commonly used in forensic microbe-typing assays such as multiple-locus variable number tandem repeat (VNTR) analysis (MLVA) and multilocus sequence typing (MLST). To prepare for possible biological attacks on U.S.

agriculture it is important to assess the capability of these commonly used microbial fingerprinting techniques to reliably type pathogens exposed to such conditions.

The objectives of the research detailed in this work are to:

1. Develop and validate a real-time PCR assay for bioforensic detection of the plant pathogenic bacterium *Pseudomonas syringae* pv. *tomato.*

2. Evaluate the degree and rates of evolutionary change in *Pseudomonas syringae* pv. *tomato*, and their impacts on microbial forensics investigations.

CHAPTER II

REVIEW OF THE LITERATURE

The events of September 11, 2001 and the subsequent anthrax mail attacks demonstrated that the United States is vulnerable to terrorist activity. As a result, the U.S. government has undertaken new security programs aimed at identifying and blocking the various avenues by which terrorists may try to commit such attacks in the future (Cupp et al., 2004).

The U.S. is vulnerable in a variety of areas, including in the agricultural sector where food production, food processing, and food distribution systems are susceptible to the threat (Harl, 2002). Agricultural systems are particularly vulnerable to attack by bioterrorists because they are of significant importance to the national economy and because certain agricultural practices, such as factory farming and cultivation of crop monocultures, have increased the potential impacts of such attacks (Foxell, 2001; Madden & Wheelis, 2003). The impacts of a biological attack on the U.S. agricultural sector, which could include reduced consumer confidence in the national food supply, food shortages and severe economic consequences, could be devastating (Cupp et al., 2004; Monke, 2007).

To discourage attacks on U.S. agriculture new regulations are being implemented at the production level and harsh criminal penalties have been put in place to serve as deterrents to would-be terrorists (Schneider et al., 2005). A national bioterrorism response plan, including increased microbial forensics capabilities, also is being developed to deal with the aftermath of a biological attack should one occur (Wheelis et al., 2002; Meyerson & Reaser, 2002). To prepare for the investigation of a biological attack on the nation's agriculture system, forensic assays must be developed and validated for use with animal and plant pathogens, as well as with environmental samples of the types that may be associated with agricultural settings (Fletcher et al., 2006).

Bioterrorism

Bioterrorism is defined as the "use of pathogens or toxins as weapons in an attack on the innocent to create fear, intimidate, inflict harm, and/or affect economic well-being" (Budowle et al., 2005b). Bioterrorist attacks are able to generate such reactions in part because of their unpredictability; an attack may occur anytime, anywhere, and with any of a number of different bioweapons (Lane et al., 2001). A bioweapon is any pathogen or biologically-derived toxin that has serious implications for the health of humans, animals, or plants, and whose use can significantly affect the healthcare, social stability, political activities, and economic development of an individual or nation (Budowle et al., 2005b).

An act of bioterrorism can be further classified based on its intended target. A direct attack on an individual is referred to as a biocrime, while the use of a biological weapon against a government or in war is known as biowarfare (Bronze et al., 2005). A third type of bioterrorism, known as agroterrorism, is aimed at negatively impacting the health of livestock or economically important plants (Bronze et al., 2005).

Agroterrorism

Agroterrorism is defined as the purposeful introduction of a pathogen or pest against livestock or into the food supply in order to generate fear or weaken stability (Chalk, 2001). Acts of agroterrorism include the introduction of pests to kill food sources, the dissemination of pathogens of economically important plants or livestock, the poisoning of food supplies or water sources, and the use of food-borne pathogens to cause illness in humans (Foxell, 2001).

Agroterrorism is a unique form of bioterrorism because it affects not only the food chain, but also the public's confidence in those foodstuffs. Furthermore, an attack on the agricultural system of the U.S. could have a worldwide impact by affecting commodity pricing, export practices, and the confidence of global markets in U.S. products (Cupp et al., 2004).

<u>History</u>

Though agroterrorism is sometimes considered to be a new threat, attacks on agricultural production have been carried out by various groups, both civilian and governmental, throughout the last 2,000 years (Carabin et al., 2005). In the

20th century alone, agricultural bioweapons are known to have been developed by at least 9 countries, including France, Germany, and the U.S. (Monke, 2007). Examples of state-sanctioned agroterrorism activities include Germany's infection of Allied horses with glanders during World War I and the infection of hooved livestock with the rinderpest virus by Japanese forces during World War II. The most notable incident of civilian agroterrorism was carried out by the Rajneeshee cult in 1984, and involved the contamination of multiple restaurant salad bars in Oregon with Salmonella in an attempt to prevent people from voting in a local election (Monke, 2007; Carus, 2002).

Vulnerability

Several factors influence the vulnerability of the U.S. agriculture system, including the economic importance of the agricultural industry, the geographical concentration of livestock production, the dispersed nature and infrequent surveillance of crop systems, increased reliance on chemical pest control methods, low crop diversity, and the threat of foreign pathogens not yet found in the U.S. (Foxell, 2001; Madden & Wheelis, 2003).

The U.S. agricultural market is a major element of our national economy. U.S. agriculture accounts for roughly 5% or $690 billion of the gross domestic product and may account for up to 17% of employment (USDA-ERS, 2010; Madden & Wheelis, 2003). Additionally, U.S. agriculture is the largest contributor to the national trade balance, contributing $50 billion annually to the global economy (Parker, 2002). The possible upset of multiple economic sectors surely makes agricultural systems desirable targets for bioterrorists.

The main vulnerability of livestock-based agricultural systems is their geographical concentration. Over 80% of all feedlot cattle in the U.S. are located in the Southwest and Midwest states, 75% of swine are concentrated in the Midwest, and 80% of all meat chickens are produced in the Southeast states (Breeze, 2004). The grouping of livestock into relatively small land areas makes it possible to wipe out the majority of the livestock in a region by introducing only a small number of infected animals (Foxell, 2001). The use of factory farming practices that group large numbers of animals into a single facility also increases the vulnerability of livestock to attack and the impact of a pathogen introduction (Gewin, 2003). Furthermore, the spread of a purposefully introduced animal pathogen could be aggravated by the long distance movement of livestock from farm to market (Chalk, 2004).

In contrast to livestock, crops are vulnerable to attack because they are grown over very large geographical areas, making security and continuous monitoring nearly impossible. For this reason, crops are considered to be “soft targets” for agroterrorists because if one is careful there is little chance of being caught in the act (Foxell, 2001; Hickson, 1999). The overall lack of monitoring in crop systems may also lead to long lag periods between the time that a pathogen is introduced and discovery of the subsequent disease, thus decreasing the likelihood of successful disease control and criminal attribution (Madden & Wheelis, 2003; Nutter & Madden, 2009).

Adding to the vulnerability of cropping systems is their low genetic diversity and farmers' heavy reliance on chemical pest control methods. In the U.S., many high value crops are grown as single cultivars, or monocultures, that are uniformly susceptible to a given pathogen (Foxell, 2001). Thus, the possibility exists that an agroterrorist could incite a region-wide pandemic through the introduction of a single pathogen (Rogers et al., 1999). Heavy dependence by growers on herbicides and pesticides to manage diseases in such monocultures has led to the natural evolution of herbicide- and pesticide-tolerant pathogens whose introduction would be extremely destructive (Foxell, 2001).

Lastly, various exotic animal and plant pathogens that occur elsewhere but have not yet entered the U.S. could be obtained easily from foreign sources and, once introduced and established, could spread quickly due to the lack of natural immunity (Foxell, 2001). Deliberate introduction of a foreign pathogen could be relatively easy because of the long, unguarded borders that exist between the U.S. and its neighboring countries (Madden & Wheelis, 2003). Furthermore, it may be possible to introduce a foreign pathogen in the U.S., without even entering the country by releasing spores from across the border or contaminating seed before it is imported (Madden & Wheelis, 2003; Condon, 1997).

<u>Pathogens</u>

Most agriculturally important pathogens can be grouped into 6 categories: viruses, viroids, bacteria, fungi, oomycetes, nematodes, and parasitic plants. Agroterrorism may involve pathogens of animals, plants, or humans, as well as zoonotic pathogens that can be transmitted from animals to humans (Cupp et al., 2004).

Animal diseases, both species-specific and zoonotic, are classified by the World Organization for Animal Health (OIE) based on their ability to spread, their potential health consequences, and the socioeconomic impacts that their intentional or accidental release could have on the global economy (Cupp et al., 2004). Diseases reportable to the OIE include anthrax, foot and mouth disease, and West Nile fever, among others (OIE, 2009). Pathogens that cause diseases on the OIE list are among the animal pathogens most likely to be employed by agroterrorists due to their ease of dissemination, high target mortality rates, and ability to cause social and economic disruption (Carabin et al., 2005; Cupp et al., 2004).

A bioterrorist seeking to target cropping systems would have a vast array of pathogens from which to choose. More than 50 thousand diseases affect plants in the U.S. alone, with many more occurring in foreign locales (Nutter & Madden, 2005). Furthermore, yield and quality can be negatively affected, in any given crop, by 5-20 serious plant pathogens, many of which also are able to infect harvested crop material (Nutter & Madden, 2005; Madden & Wheelis, 2003; Cupp et al., 2004). American cropping systems are especially vulnerable to exotic pathogens because cultivars are typically bred for protection against only endemic pathogens (Nutter & Madden, 2005). Bioterrorists may also choose to employ toxin-producing plant pathogens that not only cause disease in plants, but affect human health as well (Nutter & Madden, 2009).

Potential Impacts

Potential impacts of the deliberate introduction of an animal or plant pathogen into the U.S. agricultural sector could include decreased confidence in the national food supply, food shortages, and most importantly, economic losses due to lost production, containment costs, loss of export markets, and secondary effects on agriculturally-dependent businesses (Cupp et al., 2004; Monke, 2007).

A biological attack on U.S. agriculture is sure to evoke feelings of fear and anxiety in the general public (Chalk, 2004). As anxiety about the safety of the national food supply increases, consumers are likely to lose confidence in infected or potentially infected foods and instead turn to less popular but presumably safe items. However, an increase in demand for alternative foodstuffs could result in higher prices, and ultimately in shortages of safe and nutritious food (Monke, 2007). Food shortages could also lead to social disruption and erosion of the public's faith in the government to control the situation (Chalk, 2004).

While social instability is an important effect of an act of agroterrorism, especially in 3rd world nations, the most important consequence in the U.S. is likely to be disruption caused by financial losses at multiple economic levels (Chalk, 2004). First, direct costs would be incurred by containment measures, such as pesticide applications and drug treatments, and the eradication of diseased crops or animals as well as the value of lost production. Second, international trade markets could be negatively affected by import restrictions and protective embargoes. Lastly, economic losses could occur due to decreased revenues for agriculturally-dependent businesses such as food manufacturers, farm suppliers, and transportation services (Monke, 2007; Chalk, 2004).

Prevention and Response

The events of 9/11 and the subsequent anthrax attacks demonstrated the vulnerability of the U.S. to attack by terrorists. In recent years, considerable efforts have been aimed at reducing the vulnerability of various economic sectors, including agriculture and food production (Wheelis et al., 2002). In an effort to expand the U.S.'s ability to prevent bioterrorist attacks, Congress passed the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Schneider et al., 2005). The Bioterrorism Act designates the U.S. Food and Drug Administration (FDA) as the responsible party in: the development and implementation of regulations for the registration of food production facilities, tracking the shipment of foods into the U.S., establishment and maintenance of records used to determine the sources and recipients of food shipments, and detaining food shipments should they pose health risks to humans or animals (FDA, 2002). Furthermore, the Bioterrorism Act requires institutions wishing to possess certain high risk biological agents to register with the Centers for Disease Control and Prevention (CDC) or the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS). As part of the registration process, the facility is inspected by the permit granting agency and required to meet certain biosafety requirements to work with specific agents (USDA-APHIS, 2012a). In addition to governmental policies intended to aid in prevention of bioterrorist attacks, harsh criminal penalties have been put in place to serve as a deterrent (Schneider et al., 2005).

Though the Bioterrorism Act and similar legislation have made strides toward the prevention of bioterrorist attacks, the threat will never be eliminated. This is true for attacks on the U.S. agricultural system because of the ease with which they can be carried out. For this reason, an effective response plan is needed to manage the effects of an agricultural attack, should one occur (Schneider et al., 2005). Components of a successful bioterrorism response plan should include: early detection capability, reliable confirmation of disease diagnosis, and a rapid response network (Wheelis et al., 2002; Meyerson & Reaser, 2002).

Once a pathogen has been introduced into an agricultural system, time becomes a very important factor. If a pathogen survives and spreads undetected for long periods, eradication options may become limited and management costs may increase substantially (Meyerson & Reaser, 2002). For this reason, enhanced capabilities for detecting pathogens of high consequence may aid in minimizing the effects of an agroterrorism event (Schneider et al., 2005). For timely detection of introduced pathogens, monitoring and inventory programs conducted by well-trained individuals are essential (Wittenberg & Cock, 2001). These programs should, if possible, rely on advanced molecular techniques and give priority to high risk sites where pathogen introduction is likely to occur (Meyerson & Reaser, 2002).

Once a disease has been detected, quick and reliable diagnosis is critical. Diagnostic testing for most important diseases of crops and livestock involves sensitive molecular assays; however, many labs are not equipped for this testing and may forward samples to qualified labs, delaying disease diagnosis and the subsequent response (Wheelis et al., 2002). For this reason, the National Plant Diagnostic Network (NPDN) and the National Animal Plant Health Laboratory Network (NAHLN) were established to quickly detect important plant and animal pathogens across the U.S. (Goodell et al., n.d.; USDA-APHIS, 2012b).

Once a disease has been detected and the causative pathogen identified, a response network can effectively implement control measures (Meyerson & Reaser, 2002). As a part of a robust outbreak response program, disease-specific response plans should be prepared in advance so that actions can be taken immediately upon detection of pathogen (Wheelis et al., 2002). Response programs, developed in collaboration with state and federal governments, should include a built-in funding mechanism, sensible eradication and control mechanisms, and established regulations and policies that support the response effort (Meyerson & Reaser, 2002). In the U.S., the National Plant Disease Recovery System (NPDRS) was established to prepare recovery plans for management of high consequence plant pathogen outbreaks and the National Center for Animal Health Emergency Management (NCAHEM) develops policies for management of incidents involving animal pathogens (USDA-ARS, 2012; USDA-APHIS, 2012c).

Microbial Forensics

Microbial forensics, a sub-discipline of forensic science, is dedicated to the analysis of evidentiary materials from biocrimes, acts of bioterrorism, or the unintentional release of a pathogen or toxin, for the purpose of attribution (Budowle et al., 2003b). This emerging discipline is built on a foundation of established scientific fields including forensic science, microbiology, epidemiology, genomics, phylogenetics, and bioinformatics (Murch, 2003). Microbial forensic investigations are similar to epidemiological investigations in that they determine if a disease outbreak has occurred, identify the pathogen of interest, trace the causative agent to its source, and define the at-risk population (Morse & Budowle, 2006). However, a forensics investigation is much more extensive and is primarily concerned with the characterization of evidence to determine the sites, methods, and perpetrator of a biological attack (Budowle et al., 2003a).

To increase preparedness for possible future biological attacks, a national microbial forensics program is currently under development in the U.S. In 2002, the Federal Bureau of Investigation (FBI) established the Scientific Working Group on Microbial Genetics and Forensics (SWGMGF) to develop research priorities, diagnostic methods, certification programs, and quality assurance guidelines for the new discipline (Murch, 2003). To aid in the effort, the National

Biodefense Analysis and Countermeasures Center (NBACC) has been created by the Department of Homeland Security (DHS) to bring together all of the country's security capabilities, including public health, plant pathology, veterinary science, and law enforcement resources (Fletcher et al., 2006). The SWGMGF was disbanded in 2009 but several other institutions such as the National Institute for Microbial Forensics and Food & Agricultural Biosecurity (NIMFFAB) and the National Bioforensics Analysis Center (NBFAC) are actively engaged in the further development of a national microbial forensics capability.

Major Components of a Microbial Forensics Program

Major components of a successful microbial forensics program include development and validation of protocols for the collection and storage of bioforensic samples and technologies for the detection and identification of biological agents, creation of national databases that will aid in the investigation of bioterrorism events, establishment of a national strain repository, and the development of quality assurance (QA) guidelines (Budowle et al., 2003a; Budowle et al., 2005b).

Sampling protocols developed for use in traditional forensic investigations must be re-validated for application to samples involved in a microbial forensics investigation (Budowle et al., 2003a). Various evidence collection methods should be evaluated for efficiency and for the subsequent ability to recover chemical, physical, and biological signatures in a laboratory setting (Budowle et al., 2006). Specialized storage conditions may be required to maintain the integrity of biological samples. As with all forensic samples, environmental storage conditions should be recorded and chain-of-custody records should be maintained (Fletcher et al., 2006).

Detection and identification of pathogenic agents in a potential bioterrorism incident are among the highest priorities of a national microbial forensics program. To effectively attribute bioterrorism events, robust, sensitive and specific diagnostic assays are needed (Budowle et al., 2005b). Once developed, these methods must be rigorously validated to ensure that results are reliable and will hold up in a court of law. Validation testing should, when possible, be carried out before a diagnostic method is employed in a microbial forensics investigation and should measure the ability of the technique to achieve reliable results under specific conditions, define the conditions required to achieve reliable results, establish any limitations of the assay, identify critical control points, and provide guidelines for interpretation of results (Budowle et al., 2008).

The availability of searchable databases containing key information on pathogens of interest is an important component of a national microbial forensics capability (Budowle et al., 2005b). Such databases will aid not only in outbreak investigations, but also in the development of new assays. These databases should have the capacity to store complete genome sequences from multiple organisms and should allow for comparisons between the sequences (Murch, 2003). It has also been suggested that a relational database containing information on all individuals who have access to high-consequence pathogens be developed (Budowle et al., 2005b).

To enhance the microbial forensics capability of the U.S., the establishment of a national strain repository, housing pathogens of interest and appropriate near-neighbor organisms, has been suggested. Such a collection would provide well characterized reference organisms for the development and validation of bioforensic assays and could aid in the preliminary review process should new techniques be required for investigation of a bioterrorism event (Budowle et al., 2005b).

Lastly, QA guidelines are needed to govern the activities of forensic microbiology laboratories (Budowle et al., 2005b). The implementation of such specifications will maximize the consistency, accuracy, and validity of diagnostic processes carried out in the labs, and will aid in maintaining public confidence in their abilities (Murch, 2003; Budowle et al., 2005b).

PCR-Based Molecular Techniques

Polymerase chain reaction (PCR)-based molecular assays are very popular in microbial forensics because they are easy to perform, require very little starting material, and can be applied to both living and dead organisms (Budowle et al., 2005a). These assays are used for diagnostic purposes and for the identification of microbial signatures that can be used in tracing the relatedness and origin of a pathogen (Pattnaik & Jana, 2005).

Polymerase chain reaction is an *in vitro* process in which specific DNA sequences are copied exponentially. PCR requires four essential reagents: synthetic oligonucleotide primers that are complementary to regions flanking the target DNA sequence, a nucleic acid template or target sequence, a thermostable DNA polymerase, and deoxyribonucleoside triphosphates. All ingredients are mixed, placed into a thermocycler and subjected to 25-40 temperature cycles consisting of three phases: denaturation, specific annealing of primers and extension of annealed primers. Repetition of these temperature cycles results in the production of multiple copies of the DNA fragment of interest. Amplicons can then be detected using gel electrophoresis with an intercalating dye (Budowle et al., 2005a; Cooke Jr., 2005).

In recent years real-time PCR has become the preferred microorganism detection method because it is faster and more economical, more specific and displays a lower limit of detection when compared with traditional PCR. A real-time PCR reaction incorporates a fluorogenic probe that, when hybridized to an amplified DNA fragment, produces a signal that can be detected during the cycling process. By monitoring the strength of this signal, a computer is able to measure the accumulation of the DNA fragment of interest during the reaction, eliminating the need for end-point gel electrophoresis. Oligonucleotide primers can be designed to amplify microbial species- or strain-specific DNA targets, providing a quick and easy diagnostic test for nearly any microorganism of interest (Budowle et al., 2005a, Schaad et al., 2003).

In addition to their diagnostic utility, PCR-based assays, such as multiple-locus variable number tandem repeat (VNTR) analysis (MLVA) and multilocus sequence typing (MLST), can also be used to produce microbial signatures or DNA fingerprints, which can be used to determine microbial relatedness or to trace the origin of a pathogen of interest (Pattnaik and Jana, 2005).

Multiple-Locus Variable Number Tandem Repeat Analysis (MLVA)

Variable-number tandem repeats (VNTRs) are rapidly evolving, short genomic sequences that are tandemly repeated (Hopkins et al., 2007; Vogler et al., 2006). VNTR regions have been detected in virtually all prokaryotic and eukaryotic organisms and often vary in repeat copy number among strains of a single microbial species, a trait often exploited for strain differentiation (van Belkum et al., 2007; Coletta-Filho et al., 2001). Variation in the number of repeat copies arises due to mutations that result in the insertion or deletion of repeat units leading to the creation of multiple alleles (Vogler et al., 2006).

Microbial strain differentiation based on VNTRs is typically carried out using multiple-locus VNTR analysis (MLVA), a technique that is similar to the method used for human identification testing (Pattnaik & Jana, 2005; Budowle et al., 2003a). MLVA typing involves the PCR amplification of a series of VNTR loci, followed by electrophoretic separation of the resulting fragments. Variation in repeat copy number at a particular locus will result in amplicons of different sizes, creating a VNTR fingerprint for the strain of interest (Vogler et al., 2006; Budowle et al., 2005a). These VNTR fingerprint patterns can then be used as a confirmation of microbial species identity. Furthermore, hypervariability at a given VNTR locus can indicate that different microbial isolates originated from a common source, a finding that may be useful for attribution (Pattnaik & Jana, 2005; Keim, 2005).

MLVA typing systems have been very useful in the differentiation of pathogen strains, but they are limited in that they rely on genetic loci having high mutation rates that arise from the compounding effects of factors such as repeat unit size, repeat copy number, and sequence purity (Lindstedt, 2005; Budowle et al., 2005a; Vogler et al., 2006; Ellegren, 2000; Schlotterer, 2000). Using VNTR loci in epidemiological and forensic microbiology investigations would be enhanced by better understanding of their mutational rates and the factors affecting those rates (Vogler et al., 2006). Similarly, little is known about the stability of VNTR loci in bacteria, and research in this area will help to ensure the reliability of MLVA results in microbial forensic investigations (Hopkins et al., 2007).

Multilocus Sequence Typing (MLST)

It is sometimes possible to identify a microorganism of interest based on a single gene, such as the 16s rRNA gene in bacteria, but this type of testing does not typically provide the strain-level discrimination necessary for a microbial forensics investigation. To identify an organism to a strain level, it is often necessary to employ methods which examine several different genomic regions (Budowle et al., 2005a). Multilocus sequence typing (MLST) allows microbes to be compared based on the sequences of multiple genomic housekeeping genes that are required for normal functioning and are conserved in all bacteria (Cooke Jr., 2005; Keim et al., 2008).

In MLST, specially designed primers and PCR are used to amplify 450-500 bp fragments of 5-10 target housekeeping genes. The PCR products are then sequenced and compared to the profiles of isolates in accessible and searchable databases. MLST has effectively characterized nearly all bacterial species on which it has been used, distinguishing many to a strain level (Cooke Jr., 2005; Budowle et al., 2005a). MLST also has been used in the study of bacterial recombination and genetic diversity (Budowle et al., 2005a; Sarkar & Guttman, 2004).

Benefits of MLST for identification of microorganisms include the ability to adapt the method for use with any set of genes through specific primer design, reproducibility, and the ability to easily share sequencing data between labs via a central database (Cooke Jr., 2005; Maiden et al., 1998). However, the technique is limited in that it does not always provide reliable differentiation of strains from recently evolved bacterial species that possess little genetic variability (Keim et al., 2008). When applying MLST to these types of organisms, extensive sequencing of housekeeping genes must be done to ensure that appropriate genes are chosen for typing (Keim, 2005).

Pseudomonas syringae* pv. *tomato

Pseudomonas syringae, a plant pathogenic bacterium that causes disease in a variety of different host plant species is distributed worldwide and is responsible for considerable economic losses across the globe. To date, over 50 pathogenic variants or pathovars of the organism have been designated based on their respective host ranges. One variant, *P. syringae* pathovar *tomato* (*Pst*), displays a relatively narrow host range and is often employed as a model system for studying interactions between plants and their pathogens due to its economic importance and the ease with which it can be handled in the laboratory (Lin et al., 2006).

Characteristics of *Pst*

P. syringae, a Gram negative, rod-shaped bacterium belonging to the phylum Proteobacteria, has polar flagella and grows as a strict aerobe. Most strains produce fluorescent pigments and are differentiated from other fluorescent pseudomonads by their inability to produce arginine dihydrolase and oxidase (Doudoroff and Palleroni, 1974; Hirano and Upper, 2000).

Pst is pathogenic on *Arabidopsis thaliana*, *Brassica* species, and on tomato, in which it causes bacterial speck disease, an economically important disease of tomato for which efficient control is lacking (Lin et al., 2006; Zhao et al., 2000; Buell et al., 2003; Wilson et al., 2002).

Pst Disease Symptoms

Bacterial speck of tomato is characterized by the development of dark brown or black lesions, surrounded by yellow halos, on the leaves, stems, and fruits of the plant. Foliar lesions are typically irregular in shape and concentrated at leaf margins, while fruit lesions are raised and range in size from very small specks to roughly circular lesions 3mm in diameter (Davis et al., 2008). The disease is favored by cool weather conditions with high relative humidity, and can be exacerbated if plants remain visibly wet for long periods (Venette et al., 1996).

Dissemination of *Pst*

Pst can be found wherever tomatoes are grown and is commonly disseminated by humans, animals, insects, agricultural tools, and contaminated water or soil sources (Kokalis-Burelle, 2002; Bashan, 1986). Infested weed or crop plants, crop debris, and infected water and soil sources also serve as a source of primary inoculum in the tomato field (Schneider & Grogan, 1977; McCarter et al., 1983).

Economic Impact of *Pst*

Infection of tomato plants with *Pst* can result in the reduction of fruit quality as well as fruit yield (McCarter et al., 1983). These losses may be especially severe when infection occurs in young plants that may become stunted, resulting in the delay of fruiting (Davis et al., 2008). In infected plants that do produce fruits, symptoms of the disease often reduce the fruit palatability, making it difficult to market to consumers (Venette et al., 1996).

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CHAPTER III

DEVELOPMENT AND VALIDATION OF A REAL-TIME PCR ASSAY FOR BIOFORENSIC DETECTION OF *PSEUDOMONAS SYRINGAE PV. TOMATO*

Abstract

The U.S. agricultural system is vulnerable to biological attacks because of its economic importance and because the impacts of such attacks may be magnified by common agricultural practices. To prepare for the investigation of possible attacks, assays for the detection of plant pathogen are being developed and validated for use in a forensic context. In this work, a real-time PCR assay was developed for the plant pathogenic bacterium *Pseudomonas syringae* pv. *tomato*. Validation of the assay consisted of determination of its linearity and range, limit of detection, sensitivity, inclusivity, and exclusivity. Exclusivity of the assay was determined by testing the *P.s. tomato*-specific primers against three panels of nucleic acids: a multi-species plant panel, a multi-species animal panel, and a near-neighbor panel made up of both environmental and phylogenetic near neighbors. A positive control plasmid, distinguishable from genomic DNA by restriction enzyme digestion, was also developed and validated to support the use of the assay in forensic investigations. The resulting

assay is highly reproducible, displays linear amplification of the target DNA from 10 ng to 10 fg, is capable of consistently detecting 100 fg of target DNA, and is specific to *P.s. tomato*. Linear amplification of the positive control plasmid was observed as well. Results obtained during validation of the *P.s. tomato* assay provide a template for the development and validation of similar assays for other high threat plant pathogens.

Introduction

Food production, processing, and distribution sectors of the U.S. agricultural system are vulnerable to biological attack (Harl, 2002; Madden & Wheelis, 2003). Characteristics such as economic importance, widespread monoculturing, reliance on chemical pathogen control, scattered nature, and limited surveillance make food crops especially vulnerable to bioterrorists (Madden & Wheelis, 2003).

Traditional forensic science techniques are currently being adapted for use with plant pathogens and environmental samples that may be associated with agricultural settings in order to prepare for the investigation of possible biological attacks on U.S. agriculture (Fletcher et al., 2006). To aid in this endeavor, the Department of Homeland Security's (DHS) National Bioforensic Analysis Center (NBFAC) contracted the National Institute for Microbial Forensics and Food & Agricultural Biosecurity (NIMFFAB) at Oklahoma State University (OSU) to adapt real-time PCR assays for use with plant pathogens and to validate the assays for forensic use. The phytopathogenic bacterium

Pseudomonas syringae pathovar *tomato* (*P.s. tomato*) was chosen as a model pathogen for the first phase of the project with the expectation that the developed technology would eventually be transferred to more threatening pathogens in later phases.

P. syringae is a common bacterial pathogen that infects several economically important plant hosts, including fruits, vegetables, grains and forest trees, leading to the formation of necrotic lesions on aerial portions of the plant (Lin et al., 2006; Davis et al., 2008). *P.s. tomato*, a variant of *P. syringae* with a relatively narrow host range, infects *Brassica* species and *Solanaceae* species in which it causes bacterial speck disease (Lin et al., 2006; Zhao et al., 2000). *P.s. tomato* can serve as a bioforensics model because it meets various criteria of potential bioweapons, including ease of handling, toxin production, rate of infection and spread in nature, lack of control methods, and yield losses associated with infection (Schaad et al., 1999).

In this study, a real-time PCR assay and a positive control plasmid was developed for detection of *P.s. tomato*. The assay was then validated for use in microbial forensics investigations by determining its linearity and range, limit of detection, sensitivity, specificity, exclusivity.

Materials and Methods

Nucleic acid extraction from pure cultures, plants, and animal blood and tissue. All bacterial species used in the study (Tables 1 & 2) were grown in liquid media under optimum conditions for each organism. Bacterial DNA was extracted from isolates using the Qiagen DNeasy Blood & Tissue Kit in accordance with manufacturer's instructions (Qiagen, Valencia, CA).

DNA used in plant and animal exclusivity testing was extracted from fresh plant samples (Table 3) and animal blood or tissue (Table 4) using the Qiagen DNeasy Plant Mini and DNeasy Blood & Tissue kits according to their respective protocols.

Primer selection. A pathogen-specific primer and probe set (Table 5) amplified a 111 base pair fragment of the *Cor* gene in *P.s. tomato*. Oligo and probe sequences were designed and analyzed for size, self complementarity, GC content, and annealing temperature using Primer3 computer software and for the production of secondary structure using the Mfold web server (Rosen & Skaletsky, 2000; Zuker, 2003). The primers and a dual-labeled probe were synthesized commercially (Sigma-Aldrich, St. Louis, MO).

Real-time PCR assay. Amplification reactions were carried out on an ABI 7900HT Real-time PCR system (Applied Biosystems, Carlsbad, CA) using the ABI TaqMan® Gold with Buffer A Pack and ABI GeneAmp® dNTPs. PCR reactions of 50 µl contained 5 µl of template DNA, 5 µl of TaqMan Buffer A, 5 mM $MgCl_2$, 0.3 µM of each primer, 0.25 µM of probe, 0.25 mM of each dNTP, with the exception of dUTP, which was added at a concentration of 0.5 mM, 3 mg/ml BSA, and approximately 24 µl of sterile water. The PCR cycling conditions were as follows: initial denaturing at 95°C for 10 minutes, followed by 45 cycles of 95°C for 15 seconds and 60°C for 1 minute with fluorescence measured after each annealing step. Data were analyzed using ABI SDS software version 2.3 with an automatic baseline and a manual cycle threshold (Ct) of 0.2.

Linearity and range. The linear range and sensitivity of the assay was evaluated by analyzing serial dilutions of DNA extracted from a model strain of the pathogen, *P.s. tomato* DC3000. Ten-fold serial dilutions of DNA, from 10 ng to 10 fg, were prepared by 2 individuals and tested separately. Each analyst prepared 4 standard curves containing each of the target concentrations and tested them by real-time PCR. Repeatability was determined by calculating the %CV (CV=standard deviation/mean) for all 8 replicates of a single concentration. Intermediate precision was determined by comparing the average Ct values for replicates from each individual to each other.

Limit of reproducible detection (LOD). The lowest linearity and range standard curve concentration that gave eight of eight replicates detected with a cycle threshold less than 40 and within 2.0 Ct values of each other was considered the limit of reproducible detection (LOD). To confirm the LOD, two individuals each prepared 20 replicates of the LOD concentration and tested them by real-time PCR on separate plates to generate a total of 40 replicates. Repeatability and intermediate precision were determined as previously described.

Inclusivity testing. The inclusivity of the assay was determined by testing the pathogen-specific primers against nucleic acids extracted from a panel containing multiple strains of *P.s. tomato* (Table 1) isolated from naturally infected tomato in 11 countries. Tests were carried out at a DNA concentration of 100 pg per reaction with 3 replicates per strain.

Exclusivity testing. The exclusivity of the assay was evaluated by testing the *P.s. tomato*-specific primers against three panels of nucleic acids. Panels included: a multi-species plant panel consisting of DNA extracted from a range of species chosen for their economic importance or placement in diverse taxa (Table 3), a multi-species animal panel consisting of DNA from a range of species chosen for their economic importance and the likelihood that a species in this group would be found in association with agricultural environments (Table 4), and a near-neighbor microbe panel consisting of DNA extracted from phylogenetic and environmental neighbors of *P.s. tomato* (Table 2). Tests were carried out at a DNA concentration of 100 pg per reaction with 3 replicates per species.

Positive control plasmid development. A plasmid containing the target sequence of the *P.s. tomato*-specific primers with an inserted *Ava*I restriction site was produced commercially (Integrated DNA Technologies, San Diego, CA). The presence of the added restriction site allows the amplicon from the positive control to be distinguished from the native amplicon by restriction enzyme digestion.

Positive control plasmid sensitivity. The sensitivity of the assay was evaluated using plasmid standard curves. Ten-fold serial dilutions of plasmids, containing from 100,000 target copies to 1 target copy (calculated based on weight of the plasmid), were prepared and tested by 2 different individuals on separate days. The repeatability and intermediate precision of the assay was determined as previously described.

Positive control plasmid restriction enzyme digestion. To ensure that the positive control could be easily distinguished from genomic DNA, amplified products from genomic DNA and the cloned positive control plasmid were subjected to digestion with *Ava*I restriction enzyme. Reactions of 50 µl contained 1 µl of *Ava*I enzyme (New England Biolabs, Ipswich, MA), 5 µl of NEBuffer 4 (New England Biolabs, Ipswich, MA), and 1 ng of *P.s. tomato* DNA or 44 µl of the positive control plasmid at a concentration of 20,000 copies/µl. Reactions were held at 37°C for 1 hour. The resulting fragments were visualized by gel electrophoresis using a 2% agarose gel supplemented with 0.1 µl/ml of SYBR®Safe DNA Gel Stain (Invitrogen, Carlsbad, CA).

Results

Primer selection. The *P.s. tomato*-specific primers and probe were found to be of appropriate length (approximately 20 nucleotides) for use in real-time PCR. The forward and reverse primers and probe displayed GC contents of 45%, 55%, and 52%, and melting temperatures (T_m) of 59.9, 59.2, and 68.4 respectively. The Mfold web server did not predict any undesirable secondary structures for the oligos or the probe (Zuker, 2003).

When tested using conventional end-point PCR, the primers successfully amplified a 111 bp fragment of DNA from *P.s. tomato*. Real-time PCR carried out on *P.s. tomato* DNA using the primers and probe worked as expected indicating that the primers were suitable for use in validation of the assay.

Linearity and range. To establish the linear range of the assay, 2 analysts collected data from testing serial dilutions of *P.s. tomato* DC3000 DNA. The assay produced linear amplification of target DNA from 10 ng to 10 fg (Table 6). The %CV for all replications of a single DNA concentration were below 5.0 (Table 6), indicating that the assay is sufficiently repeatable. Additionally, average Cts for each concentration obtained by each analyst differed by fewer than 2.0 Ct values indicating that the assays display good intermediate precision (Table 6).

Limit of reproducible detection (LOD). The lowest standard curve concentration that gave 8 of 8 replicates detected with a cycle threshold less than 40.0 and within 2.0 Ct values of each other was considered the limit of reproducible detection (LOD). The presumptive LOD for the *P.s. tomato* detection assay was 100 fg of genomic DNA. Further testing confirmed this LOD (Table 7). Comparison of average Ct values between individuals and %CVs below 5.0 for each assay demonstrated that the assay is both repeatable and precise at its limit of detection (Table 7)

Inclusivity testing. The inclusivity of the assay was determined by testing the pathogen-specific primer set against a panel of DNA extracted from multiple strains of *P.s. tomato*. The assay detected all inclusivity panel members.

Exclusivity testing. The exclusivity of the assay was determined by testing the *P.s. tomato*-specific primer set against 3 panels of DNA: a near-neighbor microbe panel, a multi-species plant panel, and a multi-species animal panel (Tables 2, 3, and 4). The pathogen-specific primers did not amplify DNA from any of the tested phylogenetic or environmental neighbors.

Positive control plasmid sensitivity. The sensitivity of the assay was determined using standard curve preparations of the positive control plasmid. The assay routinely detected 100 copies of the plasmid positive control. Comparison of the average Ct values between analysts and a %CV below 5.0 demonstrated that the assay is repeatable and precise down to 100 plasmid copies (Table 8).

Positive control plasmid restriction enzyme digestion. To ensure that the positive control plasmid could be distinguished from pathogen DNA, amplicons from PCR performed on genomic DNA and plasmid preparations were subjected to digestion with the *Ava*I restriction enzyme. Digestion of the amplicon from the plasmid DNA resulted in smaller fragments that could be easily distinguished from the genomic DNA amplicon (Figure 1).

Discussion

Interest in the United States' capabilities in microbial forensics was piqued in the wake of the anthrax mail attacks of 2001. Though primary efforts in this area have been directed toward important human and animal pathogens, researchers have also recognized the need for identification and detection assays for use with high consequence plant pathogens in a forensic context (Budowle et al., 2005; Fletcher et al., 2006). Furthermore, these assays must be stringently validated to ensure their defensibility in a court of law (Harmon, 2005).

In the present study, a real-time PCR assay and positive control plasmid were developed for the model plant pathogen *P.s. tomato*. The assay was then subjected to an arduous validation process to ensure its appropriateness for use in microbial forensics investigations.

The assay consistently detected small quantities of *P.s. tomato* nucleic acid, displaying a detection limit of 100 fg of genomic DNA. Additionally, the assay demonstrated linear amplification of the standard curve concentrations from 10 ng to 10 fg, indicating that it may be employed both quantitatively and qualitatively.

Inclusivity of the assay was tested to ensure that it could be used for detection and identification of *P.s. tomato* in various geographic regions where different strains of the pathogen may be present. Results obtained from this testing indicate that the assay is able to detect multiple strains of the organism.

Assays employed in microbial forensics investigations must be exclusive to the target pathogen to ensure that their use will not lead to false-positive results from reaction of the primers with environmental nucleic acids. The assay developed in this work was found to be exclusive for *P.s. tomato*. The pathogen-specific primers produced no amplification when tested against DNA extracted from various plant, animal, and near-neighbor species, including several other pathovars of *P. syringae*.

The positive control plasmid developed for use in the *P.s. tomato* detection assay performed as expected in testing. Cleavage of the positive control amplicon into 2 smaller fragments allowed it to be easily distinguished from the bacterial DNA upon electrophoretic separation. This distinction ensures that a positive detection result is not due to contamination of sample material with the positive control, but rather due to the actual presence of the pathogen in the evidentiary material.

As the field of plant pathogen forensics continues to expand, new assays will need to be developed and validated for use with high threat and newly arising plant pathogens. The procedures employed in the validation of the *P.s. tomato* assay, and other similar assays, provide a framework by which new assays may be developed in the future.

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Table 1. Inclusivity panel used in validation of *P.s. tomato* assay

Species	Strain	Host	Origin	Source
P.s. tomato	DC3000	Tomato	United Kingdom	C. Bender, Oklahoma State University, Stillwater, OK
	1318		Switzerland	
	Pst26L		South Africa	
	3357		New Zealand	
	2844		United Kingdon	
	RG4		Venezuela	
	880		Yugoslavia	
	1108		United Kingdom	
	2846		Canada	
	30555		Australia	
	CPST 147		Czech	
	JL 1035		United States	
	TF1		United States	
	IPV-B0		Italy	

Table 2. Near-neighbor exclusivity panel used in validation of *P.s. tomato* assay

Species	Strain	Source
Burkholderia cepacia	ATCC 25416	American Type Culture Collection, Manassas, VA
Campylobacter jejuni	ATCC 33291	American Type Culture Collection, Manassas, VA
Escherichia coli	1472	S. Gilliland, Oklahoma State University, Stillwater, OK
Erwinia tracheiphila	SNS[1]	B. Bruton, USDA-ARS[2], Lane, OK
Lactobacillus delbruckeii ssp. *bulgaricus*	3409	S. Gilliland, Oklahoma State University, Stillwater, OK
Pseudomonas aeruginosa	8830	S. Gilliland, Oklahoma State University, Stillwater, OK
Pseudomonas fluorescens	ATCC 13525	American Type Culture Collection, Manassas, VA
Pseudomonas syringae pv. *maculicola*	4326	C. Bender, Oklahoma State University, Stillwater, OK
Pseudomonas syringae pv. *phaseolicola*	1448A	C. Bender, Oklahoma State University, Stillwater, OK
Pseudomonas syringae pv. *syringae*	B728A	C. Bender, Oklahoma State University, Stillwater, OK
Pseudomonas syringae pv. *tabaci*	SNS[1]	C. Bender, Oklahoma State University, Stillwater, OK
Ralstonia solanacearum	ATCC 11696	American Type Culture Collection, Manassas, VA
Rhizobium rhizogenes	ATCC 11325	American Type Culture Collection, Manassas, VA
Vibrio parahaemolyticus	ATCC 17802	American Type Culture Collection, Manassas, VA
Xanthomonas vesicatoria	ATCC 35937	American Type Culture Collection, Manassas, VA

[1]SNS - Strain not specified

[2]USDA-ARS - United States Department of Agriculture-Agricultural Research Service

Table 3. Plant exclusivity panel used in validation of *P.s. tomato* assay

Plant	Variety	Common Name	Source
Triticum aestivum	Deliver	Hard red wheat	R. Hunger, Oklahoma State University, Stillwater,OK
Medicago sativa	Vernal	Alfalfa	S. Marek, Oklahoma State University, Stillwater, OK
Hordeum vulgare	Post 90	Barley	R. Hunger, Oklahoma State University, Stillwater,OK
Secale cereale	Maton	Rye	R. Hunger, Oklahoma State University, Stillwater,OK
Avena sativa	Okay	Oat	R. Hunger, Oklahoma State University, Stillwater,OK
Oryza sativa	Drew	Rice	J. Leach, Colorado State University, Fort Collins, CO
Sorghum bicolor	Sugar Drip	Sorghum	R. Hunger, Oklahoma State University, Stillwater,OK
Glycine max	VNS[1]	Soybean	Payco Seeds, Dassel, MN
Zea mays	Kandy Korn	Corn	Ferry-Morse Seed Co., Fulton, KY
Arachis hypogaea	TX 313	Peanut	H. Melouk, USDA-ARS[2], Stillwater, OK
Gossypium hirsutum	Ac44E	Cotton	C. Bender, Oklahoma State University, Stillwater, OK
Arabidopsis thaliana	Landsberg erecta	Thale cress	Lehle Seeds, Round Rock, TX
Lycopersicon esculentum	Wisconsin 55	Tomato	L. L. Olds Seed Co., Madison, WI
Carya illinoiensis	VNS[1]	Pecan	A. Payne, Oklahoma State University, Stillwater, OK
Prunus persica	Jefferson	Peach	A. Payne, Oklahoma State University, Stillwater, OK
Vitis aestivalis	Cynthiana	Grape	A. Payne, Oklahoma State University, Stillwater, OK
Helianthus annuus	Mammoth Grey	Sunflower	L. L. Olds Seed Co., Madison, WI
Nicotiana tabacum	Samsun NN	Tobacco	J. Verchot, Oklahoma State University, Stillwater, OK
Nephrolepsis exaltata	VNS[1]	Boston fern	Department of Entomology and Plant Pathology, Stillwater, OK
Cladonia rangiferina	VNS[1]	Reindeer moss	Teresa's Plant & More Store, Mulberry, AR

[1] VNA - Variety not specified

[2] USDA-ARS - United States Department of Agriculture-Agricultural Research Service

Table 4. Animal exclusivity panel used in validation of *P.s. tomato* assay

Species	Common Name	Source
Homo sapiens	Human	M. James, Oklahoma State University, Stillwater, OK
Bos taurus	Cow	OADDL[1], Oklahoma State University, Stillwater, OK
Equus ferus	Horse	OADDL[1], Oklahoma State University, Stillwater, OK
Odocoileus virginianus	White-tailed deer	OADDL[1], Oklahoma State University, Stillwater, OK
Canis lupus	Dog	OADDL[1], Oklahoma State University, Stillwater, OK
Felis catus domesticus	Cat	OADDL[1], Oklahoma State University, Stillwater, OK
Gallus gallus	Chicken	Food Pyramid, Stillwater, OK
Mus musculus	Mouse	Biochain Institute, Inc., Newark CA
Oryctolagus cuniculus	Rabbit	Biochain Institute, Inc., Newark CA
Acyrthosiphon pisum	Pea aphid	J. Dillwith, Oklahoma State University, Stillwater, OK
Musca domestica	House fly	A. Wayadande, Oklahoma State University, Stillwater, OK

[1]OADDL - Oklahoma Animal Disease Diagnostic Laboratory

Table 5. Primer set used in *P.s. tomato* assay

Target Organism	Primer Set	Nucleotide Sequence (5'-3')
P.s. tomato	Pst-F	TGTGCCCAATACATCCAAGA
	Pst-R	CTCCGTTGTCGCTCACTCTA
	Pst-P	FAM-TTTAGCGCACCTCAACCAAAGCC-TAMRA

F - Forward, R - Reverse, P - Probe

Table 6. Average Ct values for *P.s. tomato* assay on genomic DNA

Std Curve Concentration	Avg Ct Values (8 Curves)	Std Dev (8 Curves)	%CV (8 Curves)	# Reps Detected (Out of 8)
10 ng	23.18	0.25	1.07	8
1 ng	26.55	0.16	0.61	8
100 pg	29.92	0.42	1.39	8
10 pg	33.01	0.25	0.77	8
1000 fg	35.06	0.60	1.72	8
100 fg	35.98	0.40	1.12	8
10 fg	40.07	0.48	1.20	7

Table 7. Limit of detection (LOD) of *P.s. tomato* assay on genomic DNA

Technician	DNA Concentration	Samples Tested	Postive Samples	Average Ct Value	% CV
1	100fg	20	19	36.31	2.58
2	100fg	20	18	37.07	2.11

Table 8. Average Ct values for *P.s. tomato* assay on positive control plasmid

Plasmid Copies	Avg Ct Values (8 Curves)	Std Dev (8 Curves)	%CV (8 Curves)	# Reps Detected (Out of 8)
100,000	24.58	0.49	2.01	8
10,000	28.15	0.84	2.01	8
1,000	31.84	0.76	2.40	8
100	36.15	0.53	1.47	8
10	38.58	1.67	4.32	6
1	--	--	--	0

1 2 3 4 5 6

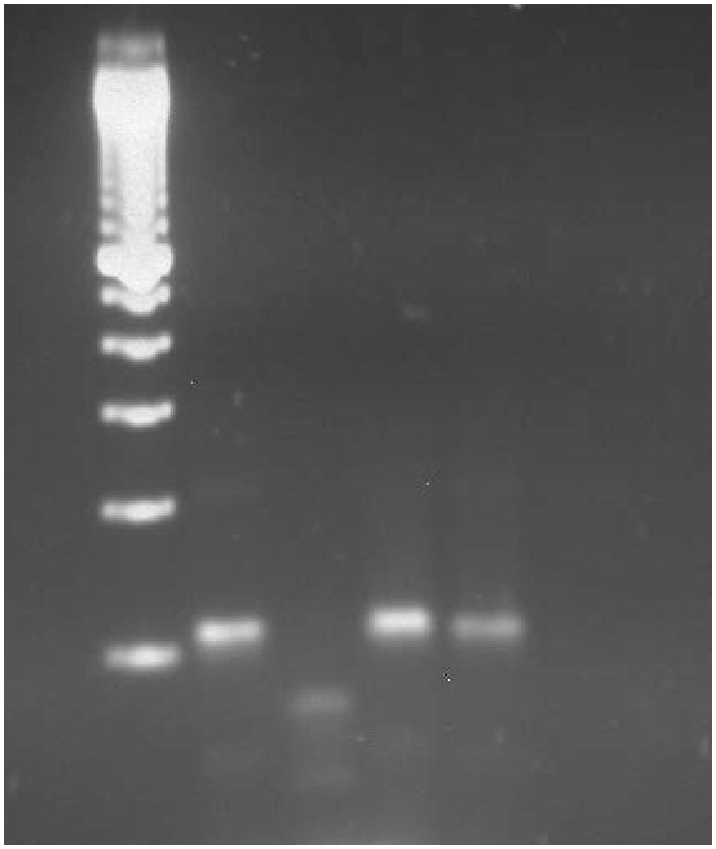

Figure 1. Agarose gel analysis of digested *P.s. tomato* genomic DNA and plasmid positive control amplicons. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, positive control plasmid – undigested; lane 3, positive control plasmid – digested; lane 4, genomic DNA – undigested; lane 5, genomic DNA – digested; lane 6, sterile water, digested

CHAPTER IV

EVALUATING THE IMPACTS OF STRESSORS OF *PSEUDOMONAS SYRINGAE PV. TOMATO* ON THE EFECTIVENESS OF MULTIPLE-LOCUS VARIABLE NUMBER TANDEM REPEAT ANALYSIS (MLVA) AND MULTILOCUS SEQUENCE TYPING (MLST) IN MICROBIAL FORENSICS INVESTIGAITONS

Abstract

U.S. cropping systems are vulnerable to agroterrorist and other criminal threats due to their widespread cultivation, lack of surveillance, and because of implementation of cultural practices such as monoculturing and heavy reliance on chemical disease control. To prepare for investigation of such events, forensic science techniques are being adapted for use with plant pathogens. Attribution of an agroterrorist event involving a plant pathogen may require determination of a molecular fingerprint or profile for the organism. Forensic methods traditionally used for this purpose include multiple-locus variable number tandem repeat (VNTR) analysis (MLVA) and multilocus sequence typing (MLST). However, use of these methods in investigations involving plant

pathogens may be problematic because long lag periods between pathogen introduction and discovery of the associated disease may provide enough time for evolution to occur in the regions of the genome employed in each assay. In this study, we investigated the ability of MLVA and MLST to reliably type the model plant pathogen *Pseudomonas syringae* pv. *tomato* DC3000, which had been exposed to various experimental treatments meant to simulate environmental conditions to which a pathogen may be exposed prior to or during a biological attack, while being subcultured sequentially for 1 year. MLVA and MLST were performed on DNA extracted from the bacterium at various time points throughout the sub-culturing process. The resulting profiles were then compared to those of the original culture of *P.s. tomato* DC3000 to determine if the growth conditions had any effect on the ability of the assays to reliably identify the pathogen which might have undergone evolution.

The MLVA fingerprints and MLST profiles were consistent throughout the experiment indicating that, using a specific set of primers and conditions, MLVA and MLST typing systems could be employed successfully in a forensics investigation involving *P.s. tomato*. However, similar experiments should be conducted in the field and with other high consequence plant pathogens to ensure that the assays are reliable for bacteria infecting plants in their natural environment and with organisms which may display faster rates of mutation than *P.s. tomato*.

Introduction

The American agricultural system is vulnerable to attack by bioterrorists in several food-related areas such as production, processing and distribution (Harl, 2002). Factors increasing the vulnerability of U.S. cropping systems to such attacks include their scattered nature, lack of surveillance, considerable monoculturing, and reliance on chemical disease control methods (Madden & Wheelis, 2003).

To prepare for the investigation of possible biological attacks on U.S. agriculture, traditional forensic science techniques are being adapted for use with plant pathogens and other environmental samples that may be associated with agricultural environments (Fletcher et al., 2006). To attribute an agroterrorism or criminal event involving a plant pathogen to a perpetrator, a microbial forensics laboratory often determines a microbial signature or fingerprint for the organism of interest (Budowle et al., 2005; Pattnaik & Jana, 2005). Methods commonly used to fingerprint pathogens, differentiate among microbial strains, and determine microbial relatedness include multiple-locus variable number tandem repeat (VNTR) analysis (MLVA) and multilocus sequence typing (MLST) (Budowle et al., 2005).

Variable number tandem repeats (VNTRs) are short, tandemly repeated genomic sequences, present in the majority of prokaryotic and eukaryotic organisms, that often vary in repeat copy number among strains of a single microbial species (van Belkum, 2007). Variation in VNTR repeat copy number is often exploited for strain differentiation using MLVA (Pattnaik & Jana, 2005).

MLVA typing involves PCR amplification of multiple VNTR loci, followed by electrophoretic separation of the resulting fragments. Variation in the number of repeats at a particular locus results in the production of amplicons of different sizes, thus creating a VNTR fingerprint for the bacterial strain of interest (Vogler et al., 2006; Budowle et al., 2005). The fingerprint is then used as a confirmation of microbial species identity. Additionally, hypervariability at a given VNTR locus, an indication that different bacterial isolates originated from a common source, may be especially useful for attribution purposes (Pattnaik & Jana, 2005; Keim, 2005).

MLVA has been used to successfully fingerprint a variety of bacteria, including *Bacillus anthracis, Escherichia coli* O157, *Brucella abortus,* and the plant pathogens *Xylella fastidiosa, Xanthomonas oryzae,* and *Pseudomonas syringae* (Lindstedt, 2005; Le Fléche et al., 2006; Zhao et al., 2012; Baker, 2009). Though useful for strain differentiation, MLVA is limited in that it relies on genetic loci having intrinsically high mutation rates (Lindstedt, 2005). Due to these high mutation rates VNTR loci can be affected by treatments such as environmental stress and serial passaging, leading to alteration in the MLVA fingerprint for an organism of interest (Cooley et al., 2010; Her et al., 2009). For this reason, a better understanding of the stability and mutational rates of VNTR loci is needed to ensure the reliability of MLVA results in microbial forensics investigations (Hopkins et al., 2007; Vogler et al., 2006).

In a microbial forensics investigation, it may also be necessary to identify a suspect microorganism to a strain-level. MLST allows for strain-level microbe identification by comparing the sequences of multiple genomic housekeeping genes that are required for normal functioning of the organism (Cooke Jr., 2005; Keim et al., 2008). In this method, PCR is used to amplify 450-500 bp fragments of 5-10 housekeeping genes. The amplicons are then sequenced and compared to the profiles of isolates stored in searchable databases (Cooke Jr., 2005).

MLST has been used effectively to characterize a variety of bacterial species and has been successfully employed in studies of bacterial recombination and genetic diversity (Budowle et al., 2005; Sarkar & Guttman, 2004). MLST is a highly reproducible method that can be easily adapted to any set of genes through specific primer design (Cooke Jr., 2005; Maiden et al., 1998). The major strength of MLST lies in its ability to detect recombination; however, the technique is limited in that it does not always provide reliable differentiation of strains from recently evolved bacterial species that display little genetic variability (Sarkar & Guttman, 2004; Feil et al., 1999; Keim et al., 2008).

The use of common forensics methods, such as MLVA and MLST, may be especially problematic in forensics investigations involving plant pathogens because long lag periods between the introduction of a pathogen and the discovery of the subsequent disease may provide ample time for the pathogen to undergo evolution in regions of the genome used in the microbe-typing assays (Madden & Wheelis, 2003; Nutter & Madden, 2009).

Pseudomonas syringe pv. *tomato*, used as a model organism in this experiment, is a Gram negative, plant pathogenic bacterium with a worldwide distribution (Doudoroff and Palleroni, 1974; Kokalis-Burelle, 2002). The pathogen infects *Arabidopsis thaliana*, *Brassica* species, and tomato, in which it causes bacterial speck disease, an economically important disease of tomato (Lin et al., 2006; Zhao et al., 2000). Though not a high-threat pathogen, *P.s. tomato* can serve as a good bioforensics model because it meets several criteria of potential bioweapons, including ease of handling, toxin production, rate of infection and spread in nature, and yield losses associated with infection (Schaad et al., 1999).

MLVA and MLST have both been employed in the study of *P.s. tomato*. A *P.s. tomato* MLVA assay has been designed for rapid strain discrimination of the pathogen. Use of the assay in typing of a large *P.s. tomato* strain collection also indicated that the assay could be used to determine phylogenetic relationships between strains (Baker, 2009). Results of the study, as well as other studies using MLVA to examine the relatedness of *P.s. tomato* strains, have found that the diversity within the pathogen is highly correlated to the host plant species in which the organism lived (Baker, 2009; Gironde & Manceau, 2012). Similarly, MLST has been used to investigate the genetic stability of *P. syringae* and to resolve the role of recombination in the evolution of the pathogen. Strains of *P. syringae* were shown to remain genetically consistent over long periods of time indicating that the species is highly clonal (Sarkar & Guttman, 2004). Using MLST, researchers were able to identify multiple recombination sites within the *P.s. tomato* genome indicating that recombination contributes greatly to the genetic variation of the organism (Yan et al., 2008).

In the present study, we examined the ability of MLVA and MLST typing methods to identify *P.s. tomato*, subjected to various treatments, in order to evaluate the appropriateness of their use in microbial forensics investigations involving plant pathogens.

Materials and Methods

Bacterial strain and experimental treatments. *P.s. tomato* DC3000, originally isolated from infected tomato in the Channel Islands, Guernsey, UK, was obtained from the laboratory of Dr. Carol Bender. Prior to beginning the experiment, the bacterium was grown in King's B broth medium under optimum conditions for the organism (28°C with shaking at 150 rpm) (King et al., 1954). This master culture was used in preparation of experimental treatments.

P.s. tomato DC3000 was exposed to four treatments, meant to simulate various environmental conditions to which a pathogen may be exposed prior to or during a biological attack, while being sequentially subcultured for one year. Treatments included: 1) *P.s. tomato* DC3000 grown under optimum laboratory conditions, 2) *P.s. tomato* DC3000 grown under sub-optimal conditions (i.e. nutritional stress), 3) mutagenesis of *P.s. tomato* DC3000 followed by growth under optimum conditions, and 4) *P.s. tomato* DC3000 grown *in planta*. Optimal growth conditions were provided by growth of the bacterium under optimized laboratory conditions (Budde et al., 1998) while growth of the bacterium in sub-optimal conditions and *in planta* represented growth of the organism in nature. Lastly, mutagenesis of *P.s. tomato* DC3000 was used to discern the effects of enhanced evolutionary rates on the reliability of the forensic assays.

The treatment grown under optimum conditions was prepared by inoculating 40 mL of King's B (KB) broth with 0.1 mL of the *P.s. tomato* master culture and incubating at 28°C with shaking at 150 rpm for 4 days. On day 3 of incubation, 10 mL of the culture was removed and total genomic DNA was extracted using the Qiagen DNeasy Blood & Tissue Kit in accordance with manufacturer's instructions (Qiagen, Valencia, CA). On day 4 of incubation, the remaining culture was used to inoculate fresh King's B broth as above. This process was repeated every four days for 1 year.

The treatment grown under sub-optimal conditions was prepared by inoculating 40 mL of mannitol-glutamate (MG) broth, a minimal medium, with 0.1 mL of the master culture (Keane et al., 1970). The culture was incubated under optimum growth conditions, and DNA extraction and sub-culturing was carried out as previously described.

Mutagenesis of 10 mL of the *P.s. tomato* master culture was carried out using ethyl methanesulfonate (EMS), a chemical mutagen that generates mutations by guanine alkylation, and a modification of the method described by Thomas and Leary (Scalera & Ward, 1971; Thomas & Leary, 1980). Ten mililiters of log phase bacteria, in KB medium, was exposed to EMS at a concentration of 1 mg per mL of broth for four hours. This culture was diluted 1 to 20 in fresh medium and incubated at 28°C with shaking at 150 rpm for 24 hours. The bacterial cells were washed by centrifugation and resuspended in fresh KB broth (Thomas & Leary, 1980). Forty milliliters of KB broth was inoculated with 0.1 mL of the culture. The culture was incubated under optimum conditions, and DNA extraction and sub-culturing were carried out as described above.

For the *in planta* treatment, three-week-old tomato (*Lycopersicum esculentum* cv. Glamour) seedlings were inoculated with the master culture of *P.s. tomato* by dipping a sterile swab into the culture and lightly rubbing onto the underside of the leaves. The inoculated plants were maintained in a growth chamber at 25°C with 50% relative humidity and a 12-hour photo period. One month after inoculation, leaf tissue from lesion margins was excised and soaked in 1 mL of sterile water for 3 hours. The solution was then streaked for isolation on KB agar plates, which were incubated at 28°C. When bacterial colonies were obvious, plates were examined using UV light for the presence of fluorescent colonies typical of *P.s. tomato* grown on this medium (Canfield et al., 1986). Several fluorescent colonies were transferred to 10 mL of KB broth and incubated at 28°C with shaking at 150 rpm for 24 hours. The bacterial suspension was used to inoculate a new tomato seedling as described above, and the remaining culture was used for DNA extraction as previously described. For this treatment, the *P.s. tomato* culture was transferred seven times over a 10 month period.

DNA extracted from liquid cultures at 6-week intervals and from each culture transfer *in planta* was subjected to molecular analysis using MLVA and MLST.

Multiple-locus Variable Number Tandem Repeat Analysis (MLVA). MLVA analysis of VNTR regions within the *P.s. tomato* genome was carried out using previously described VNTR loci (Table 1), primer pairs (Table 2) and molecular methods (Baker, 2009). PCR amplification of each VNTR locus was carried out using locus-specific PCR primers (Table 2), GoTaq Flexi DNA Polymerase reagents (Promega, Madison, WI), and PCR nucleotide mix (Fisher Bioreagents, Pittsburg, PA) in a final reaction volume of 25 microliters. Cycling conditions were as follows: 2 minutes at 95°C, followed by 30 cycles of 1 minute at 94°C, 1 minute at 55°C, and 1 minute at 72°C. Cycling was followed by final extension at 72°C for 7 minutes.

Following amplification, the MLVA fingerprint for each sample was visualized by gel electrophoresis using a 1.5% agarose gel supplemented with 0.1 µL/mL of SyBR®Safe DNA Gel stain (Invitrogen, Carlsbad, CA). To ensure that electrophoresis could adequately distinguish between the amplicon sizes MLVA was performed on a separate *Pst* strain, *P.s. tomato* 1318, that displayed a different number of repeats than *P.s. tomato* DC3000 at three of the chosen VNTR loci. *P.s. tomato* 1318 has one less repeat at the 715 and 1929 loci and 4 more repeats at the 337 locus than *P.s. tomato* DC3000. The sizes of the resulting amplicons were representative of the number of repeats at each locus in *P.s. tomato* 1318 and could be easily distinguished from those in *P.s. tomato* DC3000 based on size.

Multilocus Sequence Typing (MLST). MLST analysis of the *P.s. tomato* genome was carried out using previously published genes, primers and molecular methods (Sarkar & Guttman, 2004; Sawada et al., 1999). Core genome components evaluated encode for: glyceraldehyde-3-phosphate dehydrogenase (*gapA*), phosphofructokinase (*pfk*), sigma factor 70 (*rpoD*), aconitate hydratase B (*acnB*), phosphoglucoisomerase (*pgi*), gyrase (*gyrB*), and citrate synthase (*cts*).

PCR amplification of each gene was carried out on 10 ng of template DNA using gene-specific PCR primers (Table 3), GoTaq Flexi DNA Polymerase reagents (Promega, Madison, WI), and PCR nucleotide mix (Fisher Bioreagents, Pittsburg, PA) in a final reaction volume of 25 µL. Cycling conditions were as follows: 2 minutes at 94°C, followed by 30 cycles of 1 minute at the appropriate annealing temperature (Table 4), and 1 minute at 72°C. Following this initial PCR reaction, the PCR products were cleaned up using USB ExoSAP-IT reagent (Affymetrix, Santa Clara, CA) in accordance with manufacturer's instructions. The cleaned up products resulting from this process were then employed as template in a second amplification reaction as preparation for sequencing.

For the sequencing reaction, a master mix was prepared for each primer consisting of 10 µL sterile water, 3µL BigDye Terminator v1.1/3.1 5X Sequencing Buffer (Applied Biosystems, Carlsbad, CA), 2 µL 10 mM individual primer (Table 2), 2 µL BigDye v3.1 Ready Reaction Mix (Applied Biosystems, Carlsbad, CA), and 2 µL of cleaned up PCR product from each sample. Cycling conditions were as follows: 30 seconds at 96°C, followed by 26 cycles of 15 seconds at 50°C, and 4 minutes at 60°C. Prior to sequencing, ethanol precipitation was performed on each PCR product. Twelve microliters of sterile water, 5 µL 3M ammonium acetate and 57 µL of 100% ethanol were added to each sample and mixed before centrifugation at 4,000 rpm for 30 minutes. After discarding the supernatant, 70 µL of 70% ethanol was added to each sample, and tubes were centrifuged at 4,000 rpm for 15 minutes. The supernatant was discarded, and 10 µL of dionized water was added to tubes which were vortexed to bring the DNA into solution. The DNA was sequenced by the Oklahoma State University Recombinant DNA/Protein Core facility using an ABI Model 3730 DNA Analyzer (Applied Biosystems, Carlsbad, CA). The resulting DNA sequences were aligned, trimmed, and analyzed using MEGA 4: Molecular Evolutionary Genetics Analysis software (Tamura et al., 2007).

Results

Multiple-locus Variable Number Tandem Repeat (VNTR) Analysis (MLVA). MLVA typing of the master *P.s. tomato* DC3000 culture used to inoculate the experimental treatments resulted in a baseline fingerprint for the organism (Figure 1) in which the amplicon size for each primer pair was as expected (Table 2). MLVA fingerprints obtained for sub-cultures 11, 22, 33, 44, 55, 66, 77, 88, and 92 of non-mutagenized and mutagenized *P.s. tomato* DC3000 grown under optimal or sub-optimal conditions and *P.s. tomato* DC3000 from each plant passage did not appear to change over time. To ensure that no repeats were gained or lost over time, PCR products from amplification of each locus for all samples from each treatment were compared by gel electrophoresis. The bands were indistinguishable for all samples (Figures 2 and 3).

Multilocus Sequence Typing (MLST). Sequences for each gene were aligned and trimmed to a consistent length (Table 5). Analysis of the trimmed gene sequences from the master culture of *P.s. tomato* DC3000, sub-cultures 11, 22, 33, 44, 55, 66, 77, 88, and 92 of non-mutagenized and mutagenized *P.s. tomato* DC3000 grown under optimal or sub-optimal conditions and *P.s. tomato* DC3000 from each plant passage revealed no mutations during the sampling period.

Discussion

Attribution of a biocrime or bioterror event involving a plant pathogen may require a forensics laboratory to determine a microbial fingerprint or profile for the organism (Budowle et al., Pattnaik & Jana, 2005). However, forensic techniques traditionally used for this purpose, such as MLVA and MLST, may be problematic for use with plant pathogens because long lag periods between the time that a pathogen is introduced and the discovery of the ensuing disease may provide ample time for the pathogen to undergo change in the regions of the genome employed in these assays (Madden & Wheelis, 2003; Nutter & Madden, 20009). For this reason, it is important to understand the types and rates of mutation within these regions and to assess the capability of these assays to reliably type pathogens that may have recently undergone evolution.

Previous research has shown that VNTR loci may undergo mutation in response to serial passaging and environmental stressors, such as increased temperature, starvation, and irradiation (Her et al., 2009; Cooley et al., 2010). For example, *E. coli* O157:H7 grown with creek water as a sole nutrient source underwent triple- and quadruple-repeat changes within VNTR loci (Cooley et al., 2010). Similarly, a single *B. abortus* strain 544 was shown to gain a repeat in three observed VNTR loci during serial passaging; however, three other strains of the pathogen showed no change (Her et al., 2009). In this experiment, the MLVA fingerprint for *P.s. tomato* DC3000, generated using primers for 5 specific VNTR loci, did not change over time and was not affected by the experimental treatments. These results indicate that the VNTR regions employed in the *Pst* MLVA assay are stable within the genome and are not affected by culturing conditions. Thus, the assay could reliably type the organism in an investigation involving the pathogen; however, a similar experiment should be done in the field to ensure that other adverse natural conditions will have no effect on the validity of the assay.

Our MLST results correspond with the previous findings that the core genome of *P.* syringae is highly clonal and displays very little genetic heterogeneity (Sarkar & Guttman, 2004). Here, the nucleotide sequences of the 7 housekeeping genes employed in the *P.s. tomato* MLST assay did not change over time and were not affected by the experimental treatments, indicating that MLST could also be employed successfully in an investigation involving the pathogen. As MLST typing systems are particularly useful for detection of recombination, the results of the *P.s. tomato* MLST assay could be affected by the presence of other microorganism during growth of the pathogen (Sarkar & Guttman, 2004; Feil et al., 1999; Yan et al., 2008). To further ensure the validity of the assay, a similar experiment should be done in the field under natural environmental conditions.

The MLVA and MLST assays employed in this experiment were not affected by the various culturing conditions; however, it is important to note that selection of different VNTR loci or housekeeping genes may have revealed changes within the *P.s. tomato* DC3000 genome, thus preventing their ability to reliably type a recently evolved strain. The results of this experiment indicate that both MLVA and MLST typing systems could be employed in microbial forensics investigations involving *P.s. tomato*, but it does not mean that similar results can be expected with all plant pathogens. Plant pathogens belong to a variety of kingdoms and genera and infect various plant hosts in many different environments, and it is likely that these factors will influence the specific mutation rate of each organism. Experiments similar to those conducted here should be carried out with other important plant pathogens to ensure the validity of MLVA and MLST typing systems for those organisms. In new pathogens, whole genome sequencing could be employed to identify stable VNTR loci and housekeeping genes within the genome that could be employed in development of MLVA and MLST assays for the pathogen of interest.

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Table 1. Characteristics of VNTR loci used in MLVA typing of *P.s. tomato* DC3000

VNTR Locus[a]	Motif Length (bp)[a]	# Repeats in *Pst* DC3000[a]
715	7	7.3
1570	6	13.5
1929	144	1.9
337	125	2.9
919	829	2.0

[a]From: Baker, 2009

Table 2. VNTR primers used in MLVA typing of *P.s. tomato* DC3000

VNTR Locus Primer[a,b]	Primer Sequence (5'-3')	Product Size (bp)
715-F	TGTGCGATGACACGCTTACCCATA	314
715-R	TATTCGCGGACATTCGTGACAAGA	
1570-F	AGTCTCTGCTCTTTGGTTGGCGTA	216
1570-R	GTCTGATGTACATGGTGCGCTGGT	
1929-F	CGAACAGAACGCGGCCTTCAAATA	511
1929-R	ACAGCGACTGAGCTGATTCAGGAT	
337-F	TGGAGCACAAACTGCTCTGAGTCT	440
337-R	TACAGAGATGGCGCGATTGAGCA	
919/920-F	AAACATCAGCCAGCAAATCACCCG	829
919/920-R	AACTGTTATGCCTTGTCGCACAGC	

[a]F-forward primer, R-reverse primer
[b]Primers from: Baker, 2009

Table 3. Primers used in MLST typing of *P.s. tomato* DC3000

Primer[a]	Sequence (5'-3')
acn-Fp[b]	ACATCCCGCTGCACGCYCTGGCC
acn-Rp[b]	GTGGTGTCCTGGGAACCGACGGTG
acn-Fs[b]	ATGAARCAGATMGAAGAAATGCGCGG
acn-Rs[b]	GCCRACCATCTTYTGCGCMAGGG
cts-Fp[b]	AGTTGATCATCGAGGGCGCWGCC
cts-Rp[b]	TGATCGGTTTGATCTCGCACGG
cts-Fs[b]	CCCGTCGAGCTGCCAATWCTGA
cts-Rs[b]	ATCTCGCACGGSGTRTTGAACATC
gapA-Fps[b]	CGCCATYCGCAACCCG
gapA-Rps[b]	CCCAYTCGTTGTCGTACCA
gyrB-Fps[c]	MGGCGGYAAGTTCGATGACAAYTC
gyrB-Rps[c]	TRATVKCAGTCARACCTTCRCGSGC
pfk-Fp[b]	ACCMTGAACCCKGCGCTGGA
pfk-Rp[b]	ATRCCGAAVCCGAHCTGGGT
pfk-Fs[b]	AGCAAYATCAAGMTGGCCGA
pfk-Rs[b]	ACCATGCCKGCCARMAGCG
pgi-Fp[b]	TCAAGGACTTCAGCATGCGCGAAGC
pgi-Rp[b]	CGAGCCGCCCTGSGCCAGGTACCAG
pgi-Fs[b]	TTCAGCATGCGCGAAGCG
pgi-Rs[b]	TGCGCCAAGGTACCAGG
rpoD-Fp[c]	AAGGCGARATCGAAATCGCCAAGCG
rpoD-Rps[c]	GGAACWKGCGCAGGAAGTCGGCACG
rpoD-Fs[b]	AAGCGAATCGAAGAAGGCATYCGTG

[a]F-forward primer, R-reverse primer, p-PCR primer, s-sequencing primer
[b]Primers from: Sarker & Guttman, 2004
[c]Primers from: Sawada et al., 1999

Table 4. *P.s. tomato* DC3000 MLST PCR primer annealing temperatures

PCR Primer Set	T_a (°C)[a]
acn	60
cts	56
gapA	62
gyrB	63
pfk	63
pgi	60
rpoD	63

[a]T_a=Annealing temperature

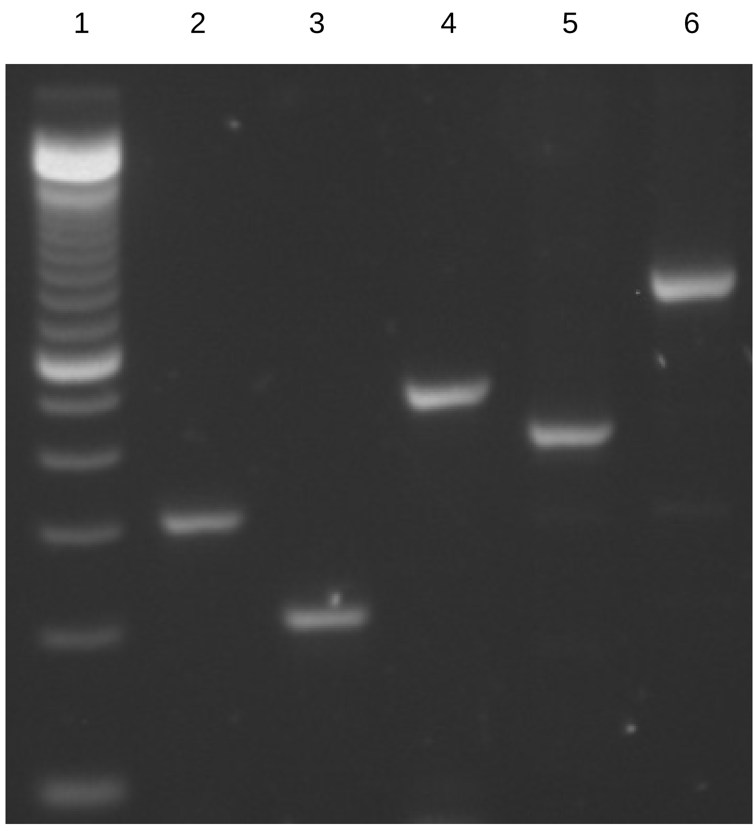

Figure 1. Representative MLVA fingerprint for *P.s. tomato* DC3000. Lane 1, 100 bp DNA ladder; lane 2, 715 locus; lane 3, 1570 locus; lane 4, 1929 locus; lane 5, 337 locus; lane 6, 919 locus.

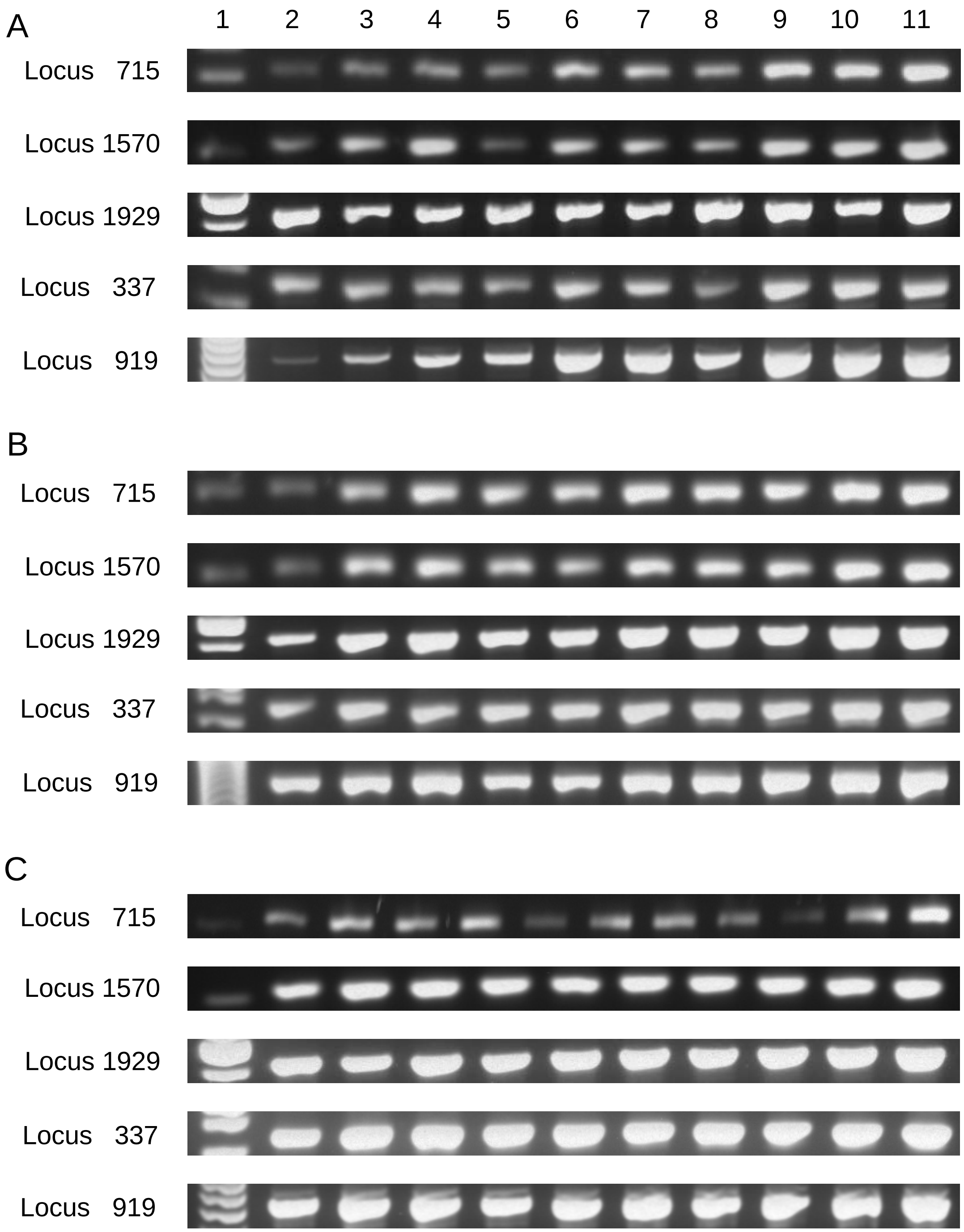

Figure 2. Comparison of agarose gel analysis of MLVA performed on *P.s. tomato* DC3000 exposed to various experimental treatments. Panel A, *P.s. tomato* DC3000 exposed to optimum growth conditions; panel B, *P.s. tomato* DC3000 exposed to sub-optimal growth conditions; panel C, mutagenized *P.s. tomato* DC3000 exposed to optimum growth conditions. Lane 1, 100 bp DNA ladder; lane 2, original *P.s. tomato* DC3000 culture used in treatment preparation; lane 3, sub-cutlure 11; lane 4, sub-culture 22; lane 5, sub-culture 33; lane 6, sub-culture 44; lane 7, sub-culture 55; lane 8, sub-culture 66; lane 9, sub-culture 77; lane 10, sub-culture 88, lane 11; sub-culture 92.

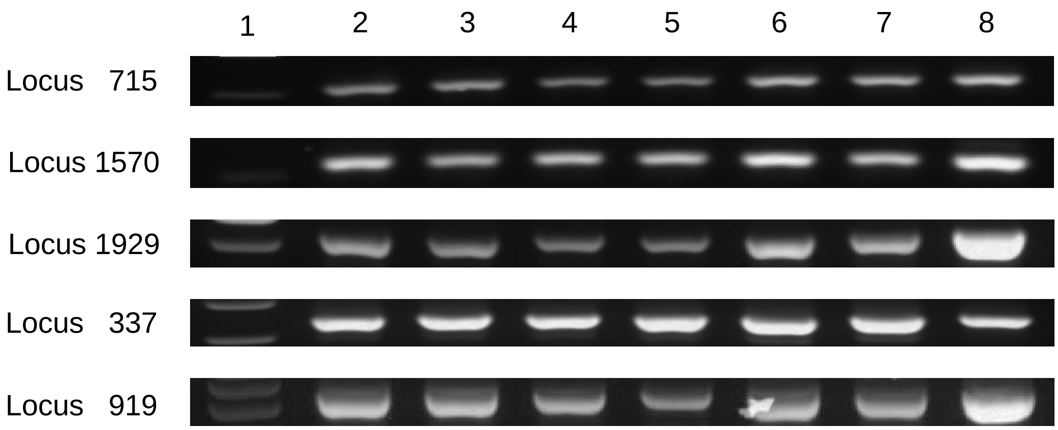

Figure 3. Comparison of agarose gel analysis of MLVA performed on *P.s. tomato* DC3000 after passage through tomato. Lane 1, 100 bp DNA ladder; lane 2, passage 1; lane 3, passage 2; lane 4, passage 3; lane 5, passage 4; lane 6, passage 5; lane 7, passage 6; lane 8, passage 7.

Table 5. Trimmed sequence lengths for genes used in *P.s. tomato* MLST assay.

Gene	Gene Length (bp)[a]	Trimmed Sequence Length (bp)
Acn	399	477
Cts	445	478
GapA	497	625
GyrB	480	575
Pfk	414	619
Pgi	448	576
RpoD	452	546

[a]From: Sarkar & Guttman, 2004

CHAPTER V

APPENDICES

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APPENDIX A

COLLECTION OF RAW DATA FROM THE VALIDATION OF A REAL-TIME PCR ASSAY FOR BIOFORENSIC DETECTION OF *PSEUDOMONAS SRYINGAE PV. TOMATO*

Table 1. Linearity and Range of *P.s. tomato* real-time PCR assay on genomic DNA

DNA Concentration	Std Curve	Ct Value[1]	Ct Avg	Std Dev	S-Curve	Probe Cleavage	Crosses Threshold	Tech
Negative Control	1	Und	--	--	No	No	No	1
	2	Und			No	No	No	
	3	Und			No	No	No	
	4	Und			No	No	No	
	5	Und			No	No	No	2
	6	Und			No	No	No	
	7	Und			No	No	No	
	8	Und			No	No	No	
10 ng	1	22.86	23.18	0.25	Yes	Yes	Yes	1
	2	23.07			Yes	Yes	Yes	
	3	23.18			Yes	Yes	Yes	
	4	22.85			Yes	Yes	Yes	
	5	23.54			Yes	Yes	Yes	2
	6	23.41			Yes	Yes	Yes	
	7	23.37			Yes	Yes	Yes	
	8	23.19			Yes	Yes	Yes	
1 ng	1	26.35	26.55	0.16	Yes	Yes	Yes	1
	2	26.60			Yes	Yes	Yes	
	3	26.36			Yes	Yes	Yes	
	4	26.46			Yes	Yes	Yes	
	5	26.77			Yes	Yes	Yes	2
	6	26.69			Yes	Yes	Yes	
	7	26.71			Yes	Yes	Yes	
	8	26.48			Yes	Yes	Yes	
100 pg	1	29.56	29.92	0.15	Yes	Yes	Yes	1
	2	30.00			Yes	Yes	Yes	
	3	29.78			Yes	Yes	Yes	
	4	29.66			Yes	Yes	Yes	
	5	30.29			Yes	Yes	Yes	2
	6	30.59			Yes	Yes	Yes	
	7	29.34			Yes	Yes	Yes	
	8	30.17			Yes	Yes	Yes	
10 pg	1	32.82	33.01	0.25	Yes	Yes	Yes	1
	2	32.89			Yes	Yes	Yes	
	3	32.58			Yes	Yes	Yes	
	4	32.91			Yes	Yes	Yes	
	5	33.38			Yes	Yes	Yes	2
	6	33.21			Yes	Yes	Yes	
	7	33.15			Yes	Yes	Yes	
	8	33.11			Yes	Yes	Yes	

1000 fg	1	35.37	35.06	0.60	Yes	Yes	Yes	1
	2	34.20			Yes	Yes	Yes	
	3	34.39			Yes	Yes	Yes	
	4	34.64			Yes	Yes	Yes	
	5	35.82			Yes	Yes	Yes	2
	6	35.35			Yes	Yes	Yes	
	7	34.96			Yes	Yes	Yes	
	8	35.70			Yes	Yes	Yes	
100 fg	1	35.97	35.98	0.40	Yes	Yes	Yes	1
	2	35.30			Yes	Yes	Yes	
	3	35.88			Yes	Yes	Yes	
	4	35.90			Yes	Yes	Yes	
	5	36.09			Yes	Yes	Yes	2
	6	36.12			Yes	Yes	Yes	
	7	35.82			Yes	Yes	Yes	
	8	36.76			Yes	Yes	Yes	
10 fg	1	40.32	40.07	0.48	Yes	Yes	Yes	1
	2	39.76			Yes	Yes	Yes	
	3	40.86			Yes	Yes	Yes	
	4	39.31			Yes	Yes	Yes	
	5	40.11			Yes	Yes	Yes	2
	6	--			Yes	Yes	Yes	
	7	39.95			Yes	Yes	Yes	
	8	40.21			Yes	Yes	Yes	

[1]Und - Undetermined

Table 2. LOD of *P.s. tomato* real-time PCR assay on genomic DNA

Tech 1 100 fg Rep	Ct Value[1]	Ct Avg	Std Dev	%CV	S-Curve	Crosses Threshold	Prove Cleavage	Tech 2 100 fg Rep	Ct Value[1]	Ct Avg	Std Dev	%CV	S-Curve	Crosses Threshold	Probe Cleavage
Neg Con	Und				No	No	No	Neg Con	Und				No	No	No
1	35.39				Yes	Yes	Yes	1	38.10				Yes	Yes	Yes
2	35.92				Yes	Yes	Yes	2	38.66				Yes	Yes	Yes
3	36.13				Yes	Yes	Yes	3	39.44				Yes	Yes	Yes
4	35.90				Yes	Yes	Yes	4	37.20				Yes	Yes	Yes
5	35.88				Yes	Yes	Yes	5	38.42				Yes	Yes	Yes
6	36.36				Yes	Yes	Yes	6	37.27				Yes	Yes	Yes
7	35.49				Yes	Yes	Yes	7	38.04				Yes	Yes	Yes
8	36.21				Yes	Yes	Yes	8	37.57				Yes	Yes	Yes
9	36.38				Yes	Yes	Yes	9	36.93				Yes	Yes	Yes
10	35.93	36.31	0.94	2.58	Yes	Yes	Yes	10	37.63	37.97	0.80	2.11	Yes	Yes	Yes
11	35.34				Yes	Yes	Yes	11	38.14				Yes	Yes	Yes
12	35.89				Yes	Yes	Yes	12	37.95				Yes	Yes	Yes
13	36.44				Yes	Yes	Yes	13	38.56				Yes	Yes	Yes
14	36.33				Yes	Yes	Yes	14	36.53				Yes	Yes	Yes
15	35.88				Yes	Yes	Yes	15	37.45				Yes	Yes	Yes
16	35.59				Yes	Yes	Yes	16	37.49				Yes	Yes	Yes
17	38.65				Yes	Yes	Yes	17	38.57				Yes	Yes	Yes
18	37.93				Yes	Yes	Yes	18	*40.21				Yes	Yes	Yes
19	*41.45				Yes	Yes	Yes	19	*40.19				Yes	Yes	Yes
20	38.22				Yes	Yes	Yes	20	39.48				Yes	Yes	Yes

[1]Und - Undetermined

*Ct values ≥ 40 were not used to calculate Ct avg, std dev, or %CV

Table 3. Inclusivity of the *P.s. tomato* real-time PCR assay

P.s. tomato Strain	Ct Value[1]	S-Curve	Probe Cleavage	Crosses Threshold
Neg Control	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
DC3000	23.98	Yes	Yes	Yes
	24.19	Yes	Yes	Yes
	24.11	Yes	Yes	Yes
1318	31.10	Yes	Yes	Yes
	31.45	Yes	Yes	Yes
	31.32	Yes	Yes	Yes
Pst26L	37.71	Yes	Yes	Yes
	37.65	Yes	Yes	Yes
	38.43	Yes	Yes	Yes
3357	39.79	Yes	Yes	Yes
	39.12	Yes	Yes	Yes
	38.99	Yes	Yes	Yes
2844	26.32	Yes	Yes	Yes
	26.43	Yes	Yes	Yes
	26.17	Yes	Yes	Yes
RG4	37.25	Yes	Yes	Yes
	36.81	Yes	Yes	Yes
	37.85	Yes	Yes	Yes
880	38.10	Yes	Yes	Yes
	35.48	Yes	Yes	Yes
	37.67	Yes	Yes	Yes
1108	38.95	Yes	Yes	Yes
	38.87	Yes	Yes	Yes
	38.86	Yes	Yes	Yes
2846	37.76	Yes	Yes	Yes
	36.51	Yes	Yes	Yes
	36.88	Yes	Yes	Yes
30555	36.52	Yes	Yes	Yes
	36.76	Yes	Yes	Yes
	36.79	Yes	Yes	Yes
CPST147	36.24	Yes	Yes	Yes
	36.41	Yes	Yes	Yes
	35.13	Yes	Yes	Yes
JL1035	39.59	Yes	Yes	Yes
	38.66	Yes	Yes	Yes
	39.90	Yes	Yes	Yes

TF1	31.59	Yes	Yes	Yes
	31.78	Yes	Yes	Yes
	29.41	Yes	Yes	Yes
IPV-B0	33.32	Yes	Yes	Yes
	32.87	Yes	Yes	Yes
	33.18	Yes	Yes	Yes

[1]Und - Undetermined

Table 4. Plant exclusivity of the *P.s. tomato* real-time PCR assay

Sample	Ct Value[1]	S-Curve	Probe Cleavage	Crosses Threshold
Neg Control	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Wheat	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Alfalfa	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Barley	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Rye	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Oat	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Rice	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Sorghum	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Corn	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Peanut	*32.89	No	No	No
	Und	No	No	No
	Und	No	No	No
Cotton	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Thale cress	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Tomato	Und	No	No	No
	Und	No	No	No
	Und	No	No	No

Pecan	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Peach	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Grape	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Sunflower	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Tobacco	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Boston fern	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Reindeer moss	Und	No	No	No
	Und	No	No	No
	Und	No	No	No

[1]Und - Undetermined

*False-positive

Table 5. Animal exclusivity of the *P.s. tomato* real-time PCR assay

Sample	Ct Value[1]	S-Curve	Probe Cleavage	Crosses Threshold
Neg Control	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Human	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Cow	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Chicken	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Horse	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Deer	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Dog	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Cat	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Mouse	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Rabbit	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
House fly	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
Pea aphid	Und	No	No	No
	Und	No	No	No
	Und	No	No	No

[1]Und - Undetermined

Table 6. Near-neighbor exclusivity of the *P.s. tomato* real-time PCR assay

Sample	Ct Value[1]	S-Curve	Probe Cleavage	Crosses Threshold
Neg Control	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
B. cepacia	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
E. tracheiphila	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
E. coli	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
L.d. bulgaricus	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
P. fluorescens	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
P.s. maculicola	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
P.s. phaseolicola	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
P.s. syringae	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
P.s. tabaci	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
R. rhizogenes	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
V. parahaemolyticus	Und	No	No	No
	Und	No	No	No
	Und	No	No	No

X. vesicatoria	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
P. capsici	Und	No	No	No
	Und	No	No	No
	Und	No	No	No
R. solanacearum	Und	No	No	No
	Und	No	No	No
	Und	No	No	No

[1]Und - Undetermined

Table 7. Sensitivity of the *P.s. tomato* real-time PCR assay on positive control plasmid

Standard Curve	Copy #	Ct Value[1]	Ct Avg	Std Dev	%CV	S-Curve	Probe Cleavage	Crosses Threshold
1	Neg Control	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
	100,000	24.27	24.26	0.13	0.52	Yes	Yes	Yes
		24.38				Yes	Yes	Yes
		24.13				Yes	Yes	Yes
	10,000	28.21	27.90	0.80	2.86	Yes	Yes	Yes
		26.99				Yes	Yes	Yes
		28.50				Yes	Yes	Yes
	1,000	31.76	32.13	0.35	1.09	Yes	Yes	Yes
		32.19				Yes	Yes	Yes
		32.45				Yes	Yes	Yes
	100	34.98	35.83	0.86	2.41	Yes	Yes	Yes
		36.70				Yes	Yes	Yes
		35.80				Yes	Yes	Yes
	10	37.90	35.55	0.85	2.40	Yes	Yes	Yes
		39.50				Yes	Yes	Yes
		39.24				Yes	Yes	Yes
	1	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
2	Neg Control	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
	100,000	23.27	23.99	0.70	2.94	Yes	Yes	Yes
		24.68				Yes	Yes	Yes
		24.02				Yes	Yes	Yes
	10,000	28.56	28.00	0.55	1.96	Yes	Yes	Yes
		27.47				Yes	Yes	Yes
		27.98				Yes	Yes	Yes
	1,000	31.14	31.28	1.29	4.14	Yes	Yes	Yes
		32.64				Yes	Yes	Yes
		30.07				Yes	Yes	Yes
	100	36.68	35.81	0.93	2.59	Yes	Yes	Yes
		35.91				Yes	Yes	Yes
		34.83				Yes	Yes	Yes
	10	37.20	37.98	1.15	3.03	Yes	Yes	Yes
		37.44				Yes	Yes	Yes
		39.30				Yes	Yes	Yes
	1	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No

3	Neg Control	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
	100,000	24.84	24.60	0.62	2.53	Yes	Yes	Yes
		25.07				Yes	Yes	Yes
		23.90				Yes	Yes	Yes
	10,000	28.27	27.91	0.58	2.08	Yes	Yes	Yes
		28.21				Yes	Yes	Yes
		27.24				Yes	Yes	Yes
	1,000	32.24	30.67	1.36	4.44	Yes	Yes	Yes
		29.94				Yes	Yes	Yes
		29.83				Yes	Yes	Yes
	100	35.40	35.41	0.15	0.42	Yes	Yes	Yes
		35.56				Yes	Yes	Yes
		35.26				Yes	Yes	Yes
	10	39.74	38.63	2.42	6.25	Yes	Yes	Yes
		35.86				Yes	Yes	Yes
		40.30				Yes	Yes	Yes
	1	40.75	40.61	0.53	1.30	No	No	No
		41.06				No	No	No
		40.03				No	No	No
4	Neg Control	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
	100,000	24.38	23.95	0.42	1.74	Yes	Yes	Yes
		23.93				Yes	Yes	Yes
		23.55				Yes	Yes	Yes
	10,000	27.44	27.60	0.69	2.51	Yes	Yes	Yes
		28.36				Yes	Yes	Yes
		27.01				Yes	Yes	Yes
	1,000	31.43	31.27	0.27	0.87	Yes	Yes	Yes
		30.95				Yes	Yes	Yes
		31.42				Yes	Yes	Yes
	100	35.60	35.93	0.29	0.80	Yes	Yes	Yes
		36.06				Yes	Yes	Yes
		36.13				Yes	Yes	Yes
	10	40.69	39.51	1.04	2.62	Yes	Yes	Yes
		39.09				Yes	Yes	Yes
		38.75				Yes	Yes	Yes
	1	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No

5	Neg Control	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
	100,000	25.20	25.16	0.06	0.26	Yes	Yes	Yes
		25.09				Yes	Yes	Yes
		25.19				Yes	Yes	Yes
	10,000	28.46	29.82	1.91	6.41	Yes	Yes	Yes
		29.00				Yes	Yes	Yes
		32.01				Yes	Yes	Yes
	1,000	32.61	31.67	1.31	4.13	Yes	Yes	Yes
		30.18				Yes	Yes	Yes
		32.21				Yes	Yes	Yes
	100	35.85	36.04	0.60	1.66	Yes	Yes	Yes
		36.72				Yes	Yes	Yes
		35.57				Yes	Yes	Yes
	10	Und	41.49	1.18	2.84	Yes	Yes	Yes
		40.66				Yes	Yes	Yes
		42.32				Yes	Yes	Yes
	1	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
6	Neg Control	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
	100,000	24.29	25.26	1.00	3.97	Yes	Yes	Yes
		25.19				Yes	Yes	Yes
		26.29				Yes	Yes	Yes
	10,000	28.58	28.87	1.27	4.40	Yes	Yes	Yes
		27.77				Yes	Yes	Yes
		30.26				Yes	Yes	Yes
	1,000	33.05	33.06	0.89	2.68	Yes	Yes	Yes
		32.17				Yes	Yes	Yes
		33.95				Yes	Yes	Yes
	100	36.26	36.66	0.35	0.96	Yes	Yes	Yes
		36.79				Yes	Yes	Yes
		36.93				Yes	Yes	Yes
	10	41.05	41.40	0.49	1.19	Yes	Yes	Yes
		Und				Yes	Yes	Yes
		41.75				Yes	Yes	Yes
	1	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No

7	Neg Control	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
	100,000	24.71	24.83	0.10	0.42	Yes	Yes	Yes
		24.88				Yes	Yes	Yes
		24.89				Yes	Yes	Yes
	10,000	28.24	28.03	0.32	1.14	Yes	Yes	Yes
		27.66				Yes	Yes	Yes
		28.19				Yes	Yes	Yes
	1,000	32.35	32.23	1.33	4.14	Yes	Yes	Yes
		33.50				Yes	Yes	Yes
		30.84				Yes	Yes	Yes
	100	35.78	37.02	1.29	3.49	Yes	Yes	Yes
		36.93				Yes	Yes	Yes
		38.36				Yes	Yes	Yes
	10	Und	39.91	0.39	0.98	Yes	Yes	Yes
		40.19				Yes	Yes	Yes
		39.64				Yes	Yes	Yes
	1	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
8	Neg Control	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No
	100,000	24.57	24.57	0.57	2.31	Yes	Yes	Yes
		24.01				Yes	Yes	Yes
		25.14				Yes	Yes	Yes
	10,000	25.76	27.07	1.44	5.31	Yes	Yes	Yes
		28.61				Yes	Yes	Yes
		26.85				Yes	Yes	Yes
	1,000	30.71	32.40	1.52	4.69	Yes	Yes	Yes
		33.66				Yes	Yes	Yes
		32.82				Yes	Yes	Yes
	100	36.51	36.50	0.39	1.08	Yes	Yes	Yes
		36.89				Yes	Yes	Yes
		36.10				Yes	Yes	Yes
	10	39.88	39.87	2.95	7.40	Yes	Yes	Yes
		36.92				Yes	Yes	Yes
		42.82				Yes	Yes	Yes
	1	Und	--	--	--	No	No	No
		Und				No	No	No
		Und				No	No	No

[1]Und - Undetermined

APPENDIX B

MLVA FINGERPRINTS FOR *P.S. TOMATO* SAMPLES

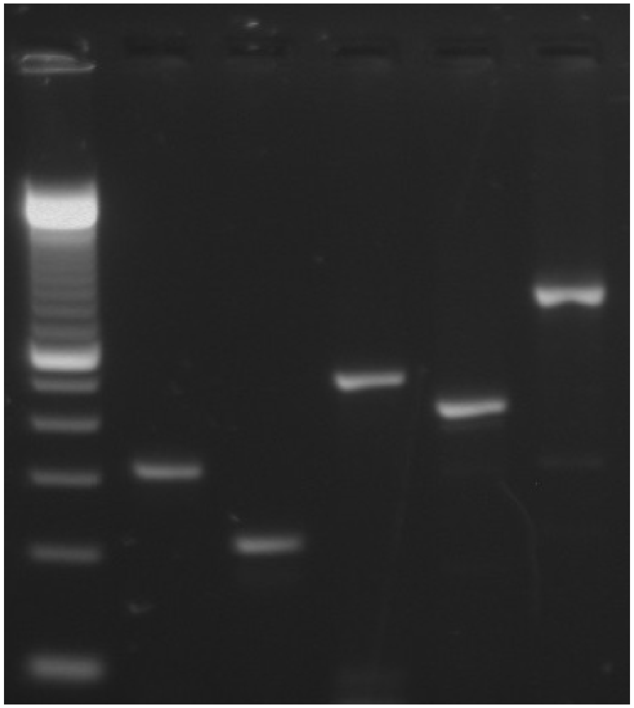

Figure 1. MLVA fingerprint for original culture of *P.s. tomato* DC3000. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

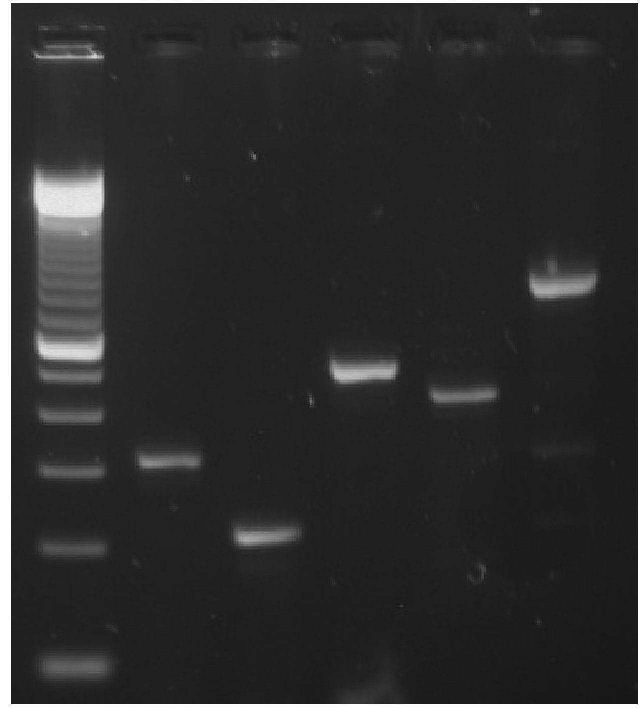

Figure 2. MLVA fingerprint for sub-culture 11 of *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

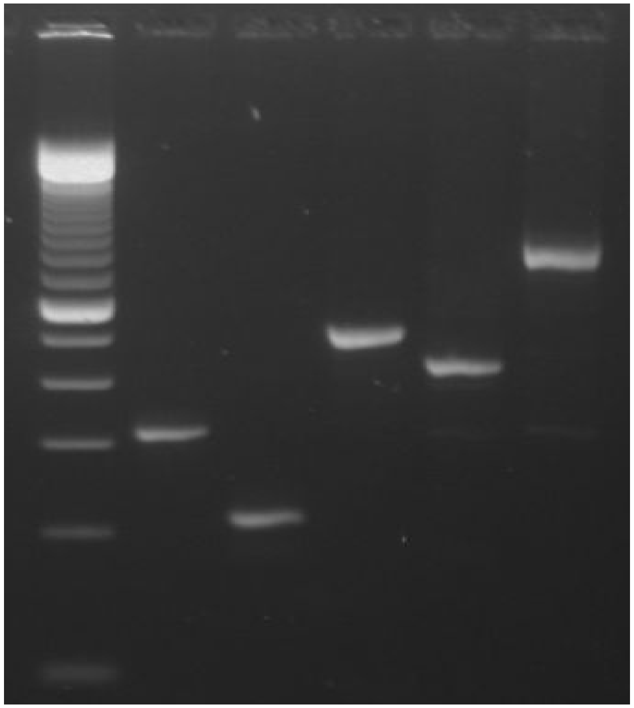

Figure 3. MLVA fingerprint for sub-culture 22 of *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

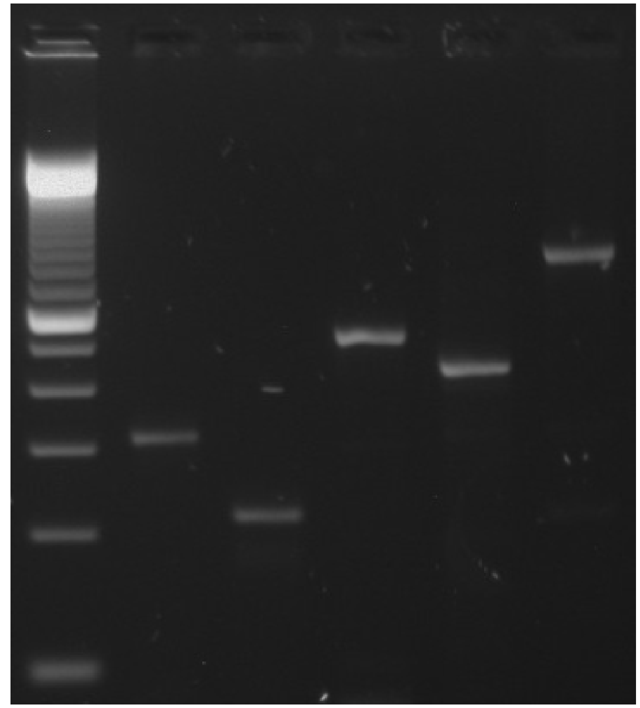

Figure 4. MLVA fingerprint for sub-culture 33 of *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

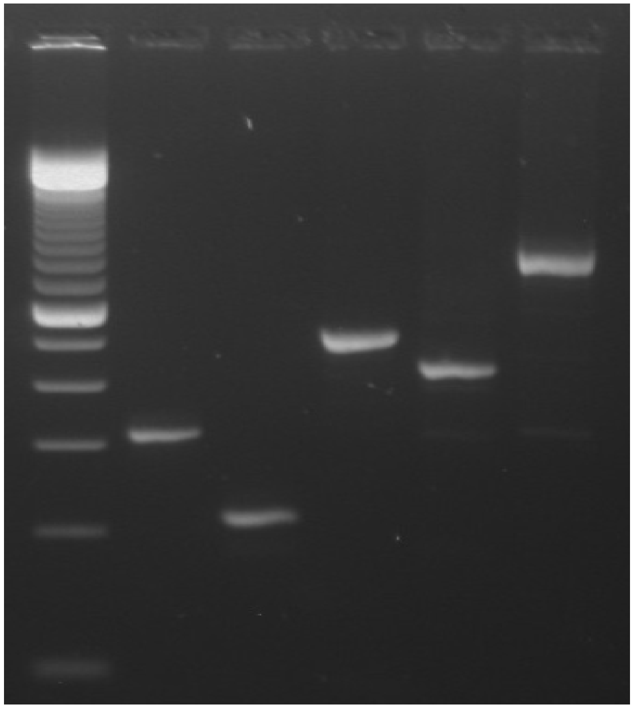

Figure 5. MLVA fingerprint for sub-culture 44 of *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

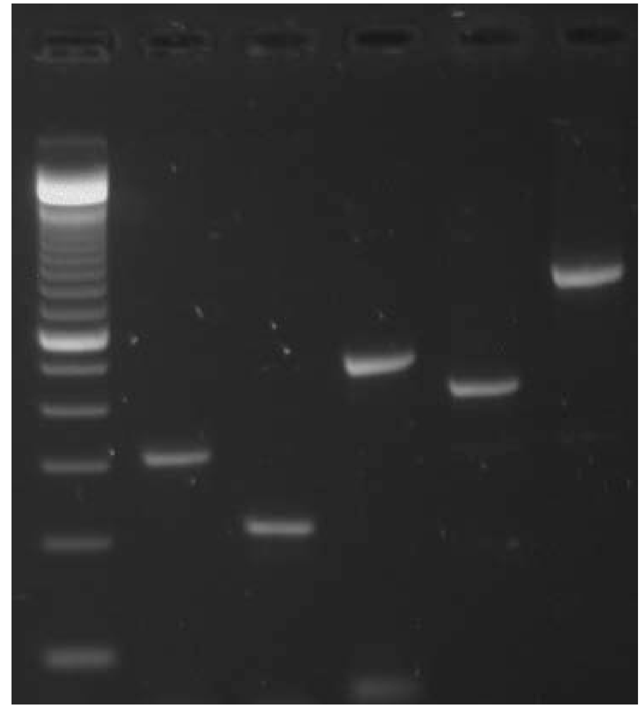

Figure 6. MLVA fingerprint for sub-culture 55 of *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

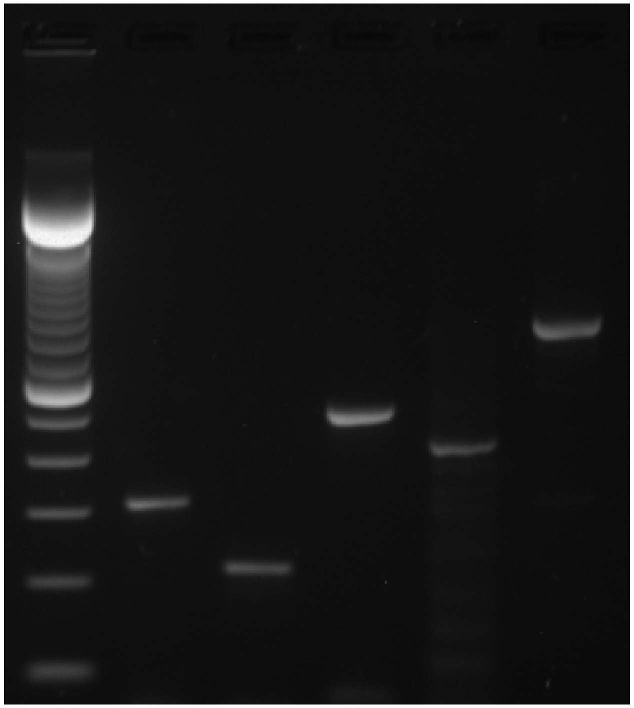

Figure 7. MLVA fingerprint for sub-culture 66 of *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

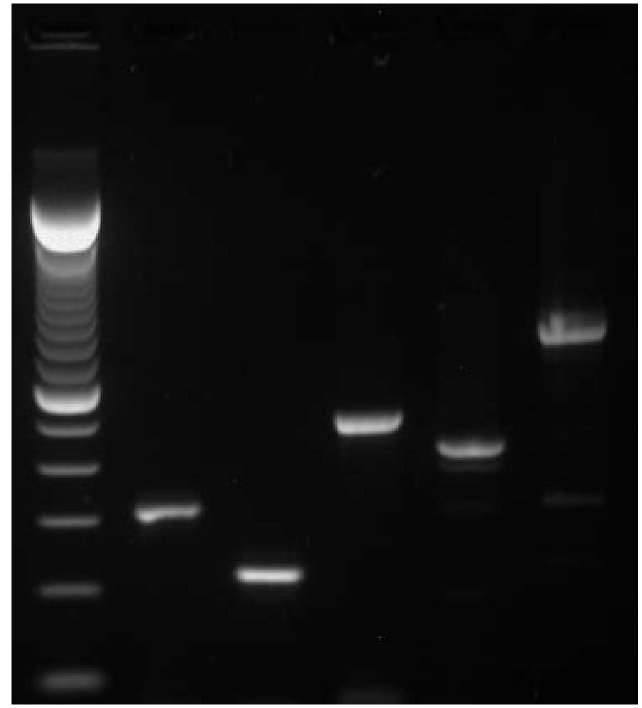

Figure 8. MLVA fingerprint for sub-culture 77 of *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

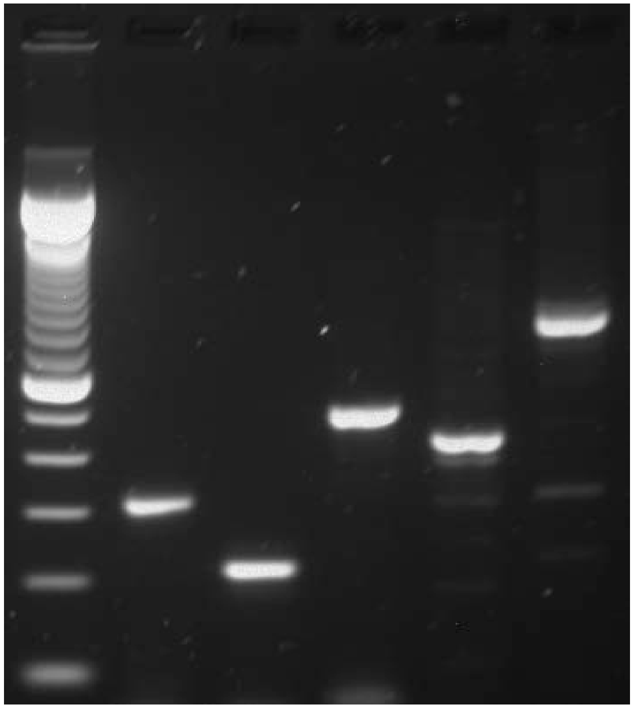

Figure 9. MLVA fingerprint for sub-culture 88 of *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

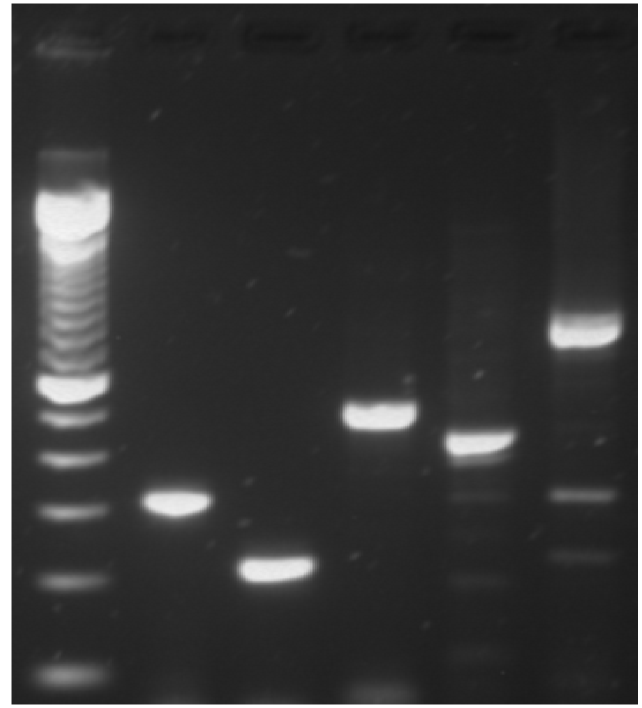

Figure 10. MLVA fingerprint for sub-culture 92 of *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

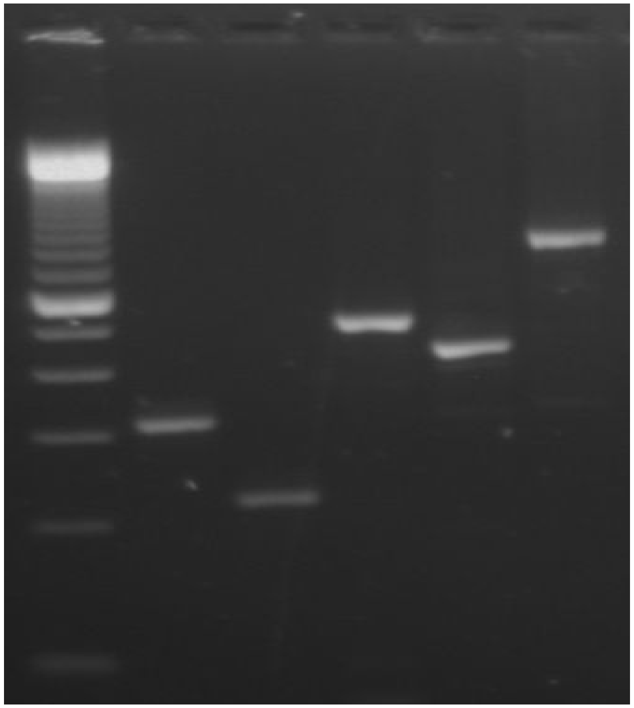

Figure 11. MLVA fingerprint for sub-culture 11 of *P.s. tomato* DC3000 grown under sub-optimal conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

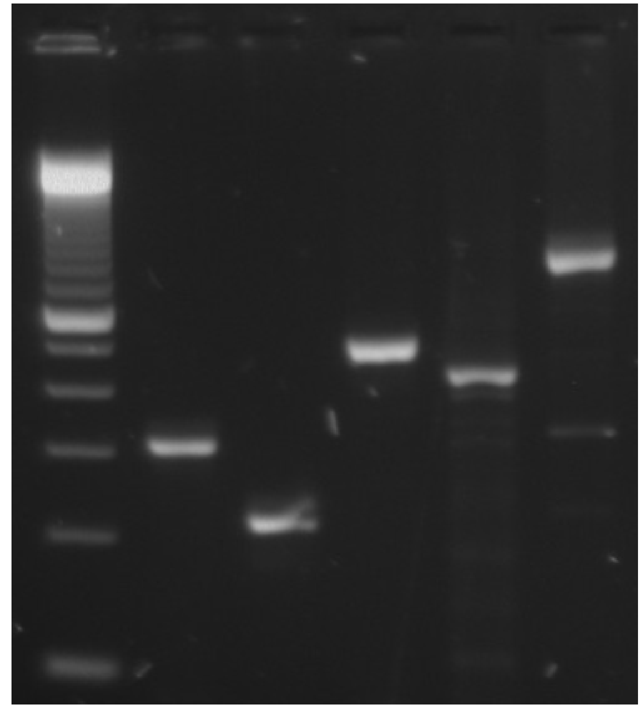

Figure 12. MLVA fingerprint for sub-culture 22 of *P.s. tomato* DC3000 grown under sub-optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

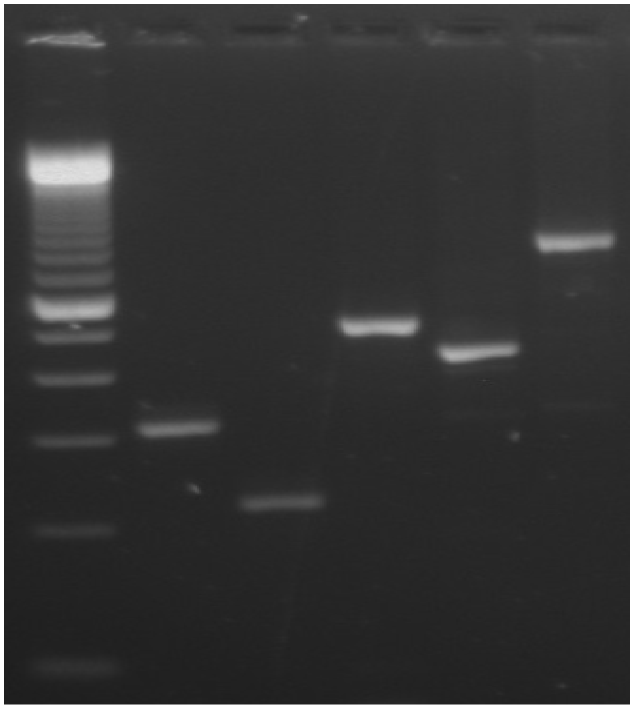

Figure 13. MLVA fingerprint for sub-culture 33 of *P.s. tomato* DC3000 grown under sub-optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

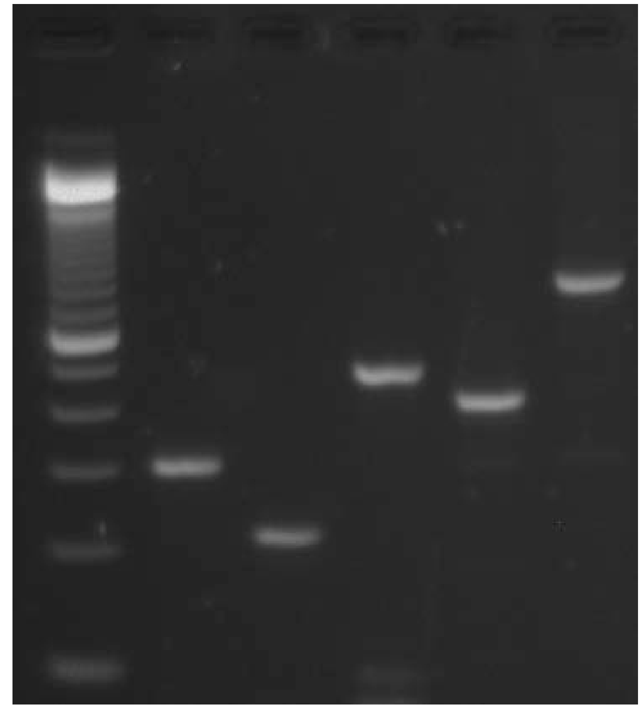

Figure 14. MLVA fingerprint for sub-culture 44 of *P.s. tomato* DC3000 grown under sub-optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

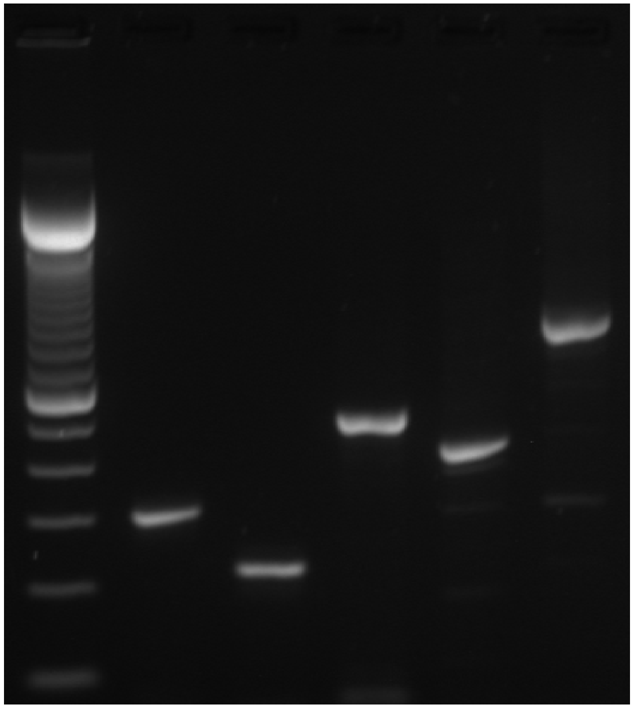

Figure 15. MLVA fingerprint for sub-culture 55 of *P.s. tomato* DC3000 grown under sub-optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

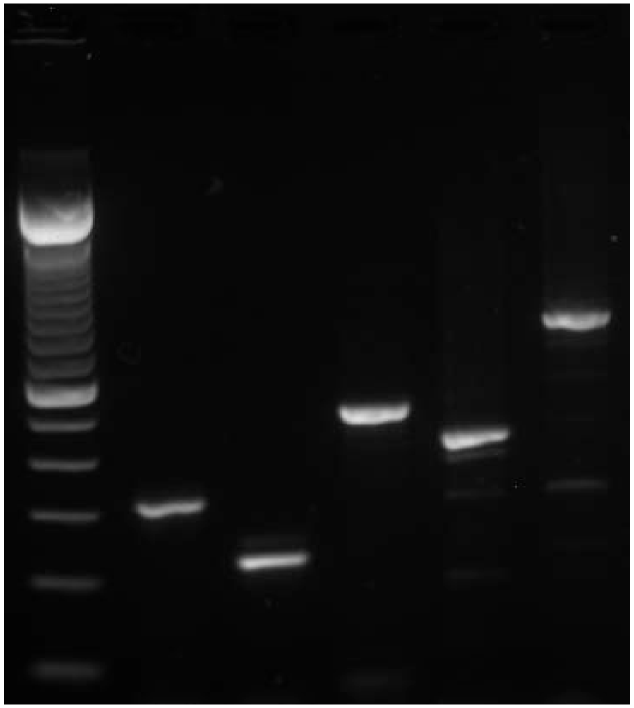

Figure 16. MLVA fingerprint for sub-culture 66 of *P.s. tomato* DC3000 grown under sub-optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

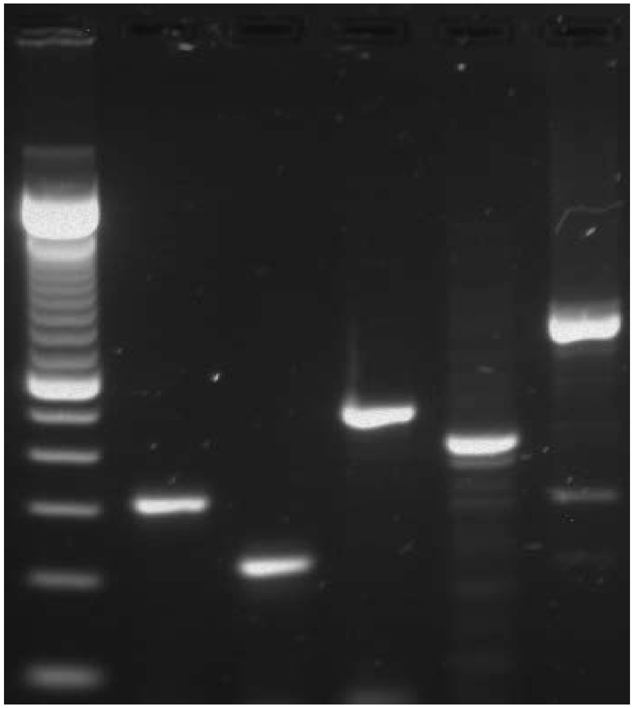

Figure 17. MLVA fingerprint for sub-culture 77 of *P.s. tomato* DC3000 grown under sub-optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

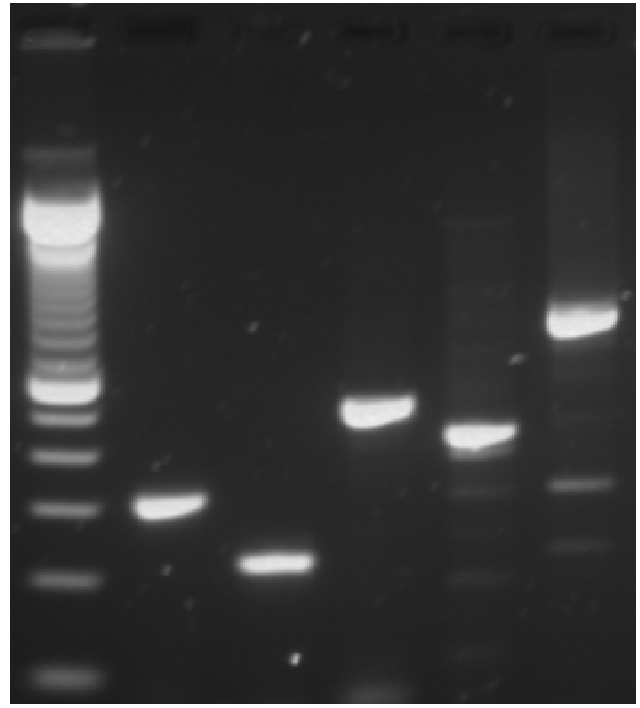

Figure 18. MLVA fingerprint for sub-culture 88 of *P.s. tomato* DC3000 grown under sub-optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

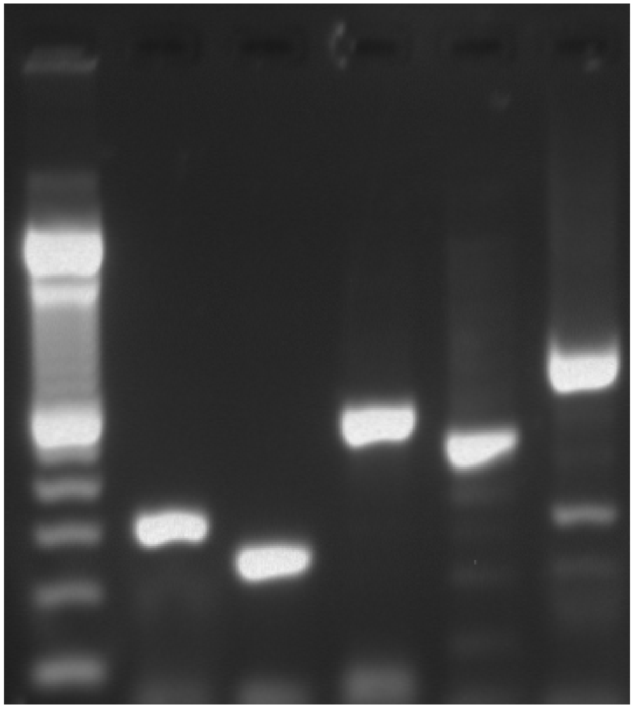

Figure 19. MLVA fingerprint for sub-culture 92 of *P.s. tomato* DC3000 grown under sub-optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

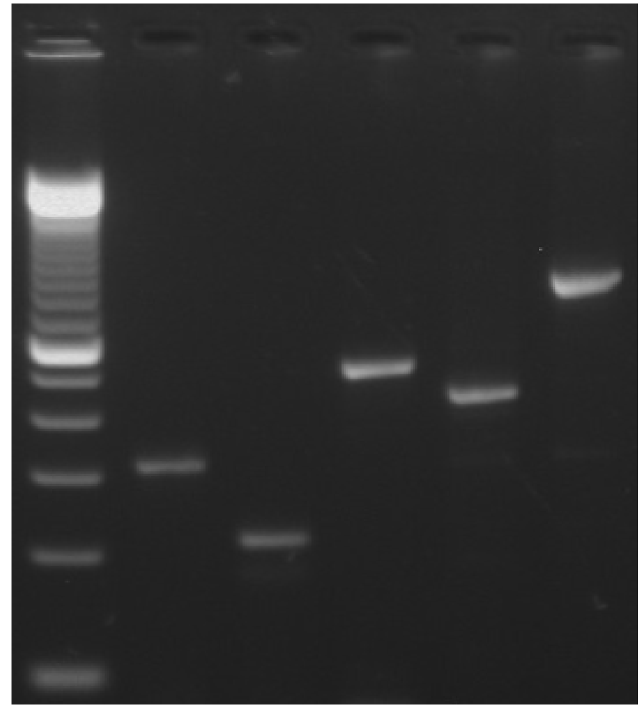

Figure 20. MLVA fingerprint for original mutagenized culture of *P.s. tomato* DC3000. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

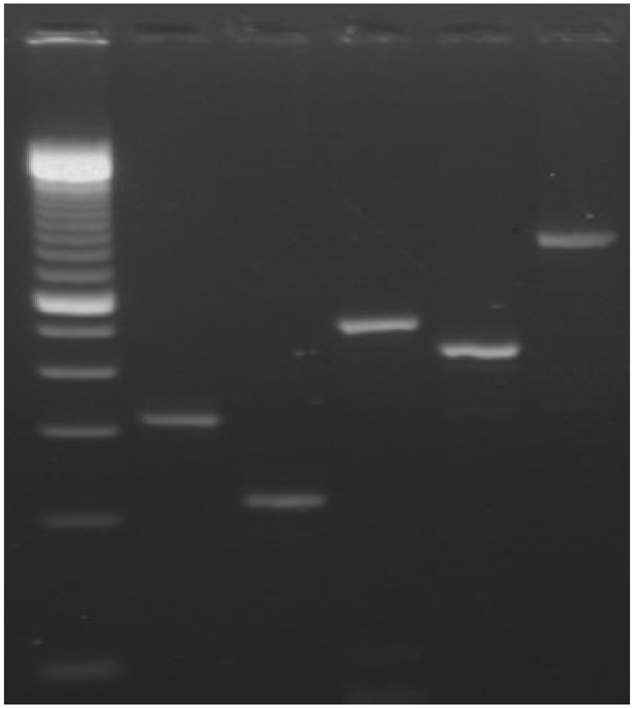

Figure 21. MLVA fingerprint for sub-culture 11 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

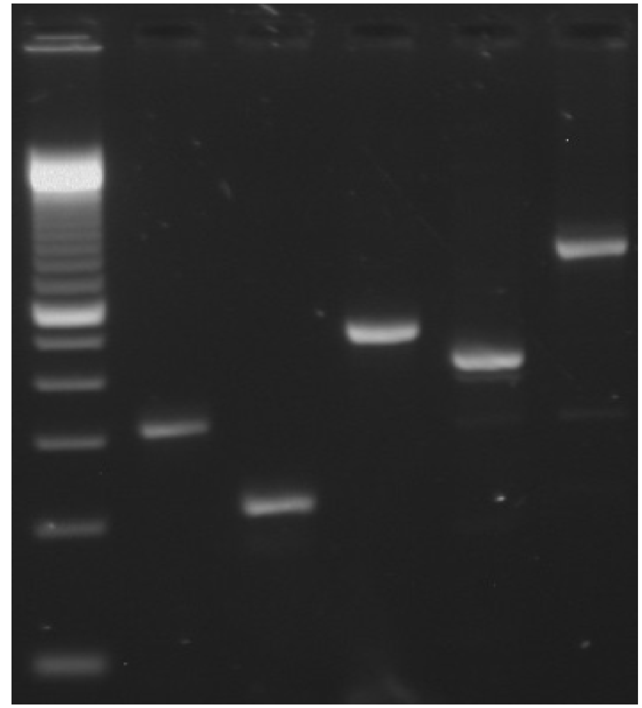

Figure 22. MLVA fingerprint for sub-culture 22 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

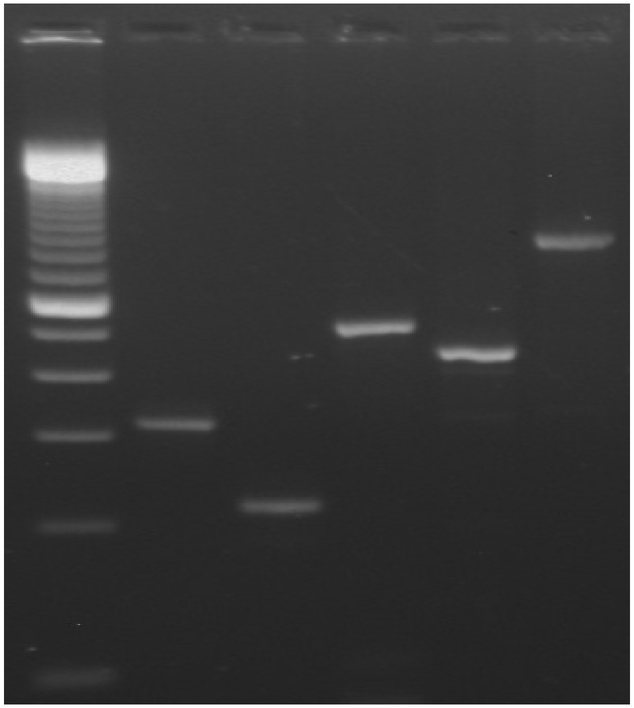

Figure 23. MLVA fingerprint for sub-culture 33 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

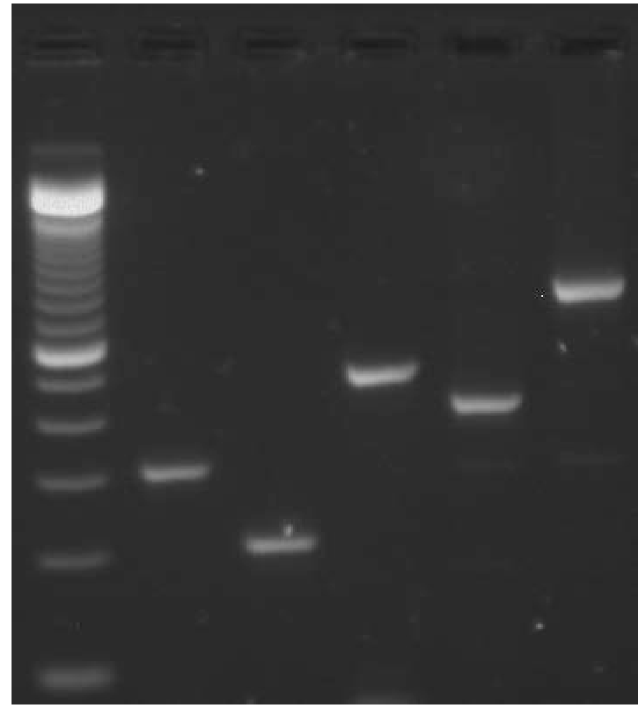

Figure 24. MLVA fingerprint for sub-culture 44 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

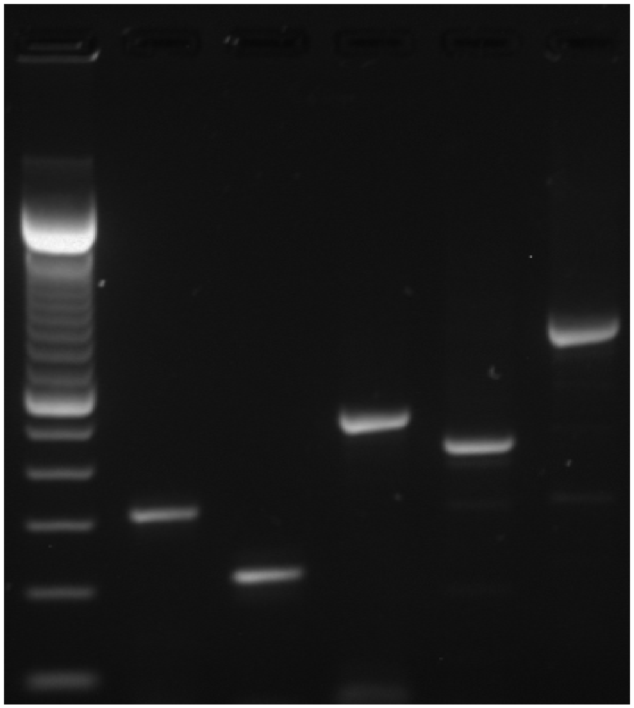

Figure 25. MLVA fingerprint for sub-culture 55 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

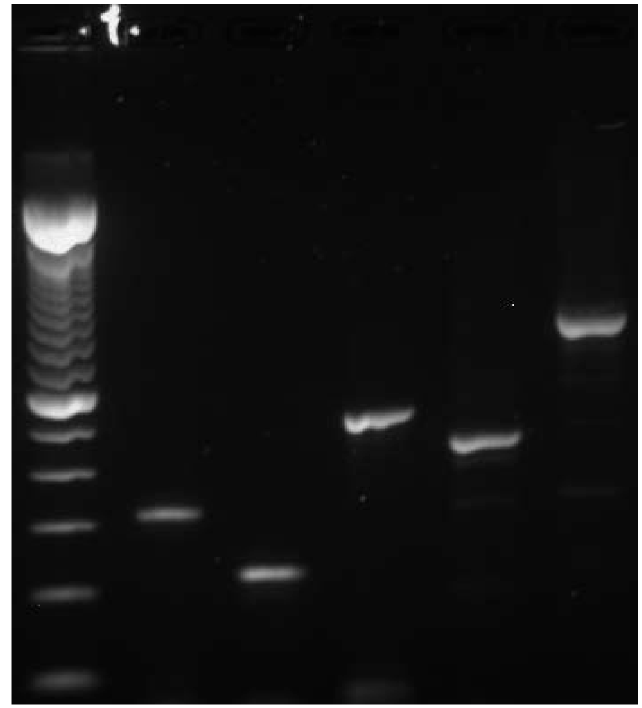

Figure 26. MLVA fingerprint for sub-culture 66 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

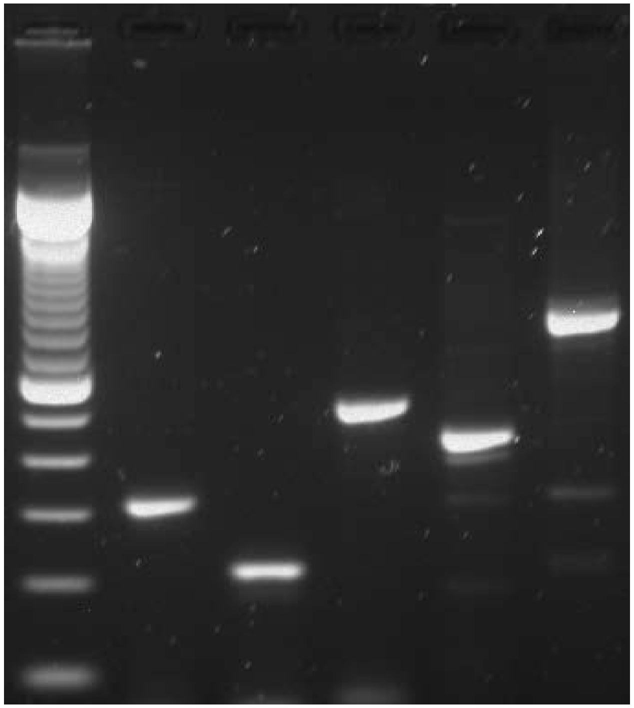

Figure 27. MLVA fingerprint for sub-culture 77 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

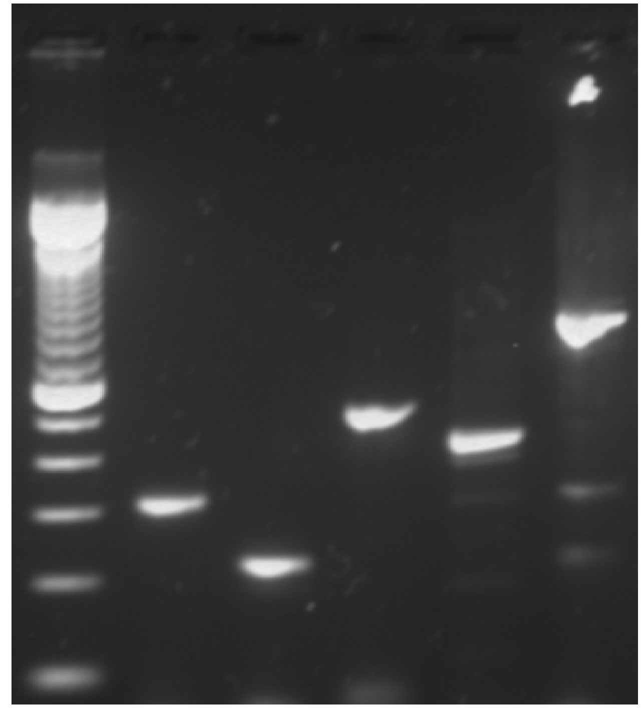

Figure 28. MLVA fingerprint for sub-culture 88 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

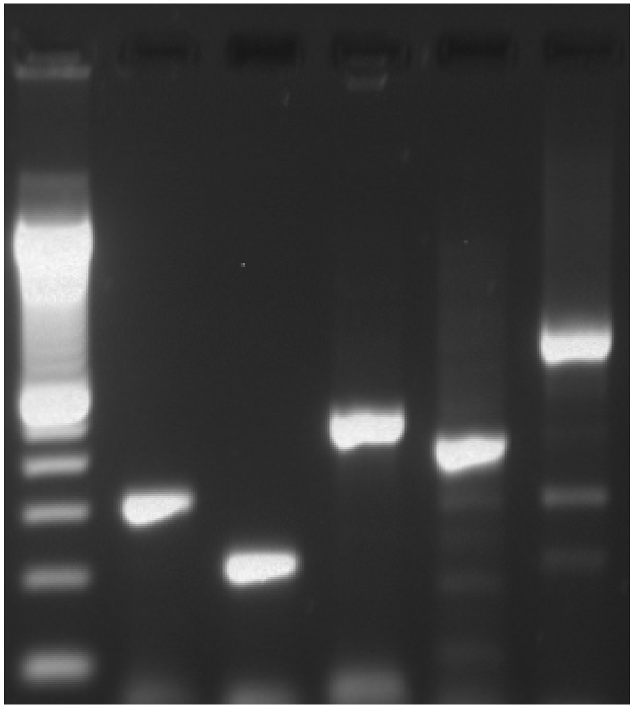

Figure 29. MLVA fingerprint for sub-culture 92 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

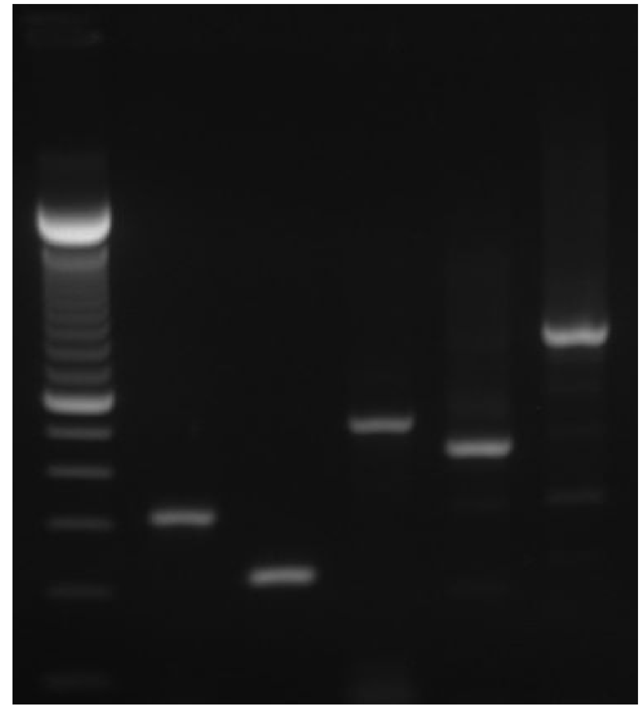

Figure 30. MLVA fingerprint for *P.s. tomato* DC3000 after 1 passage through tomato . Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

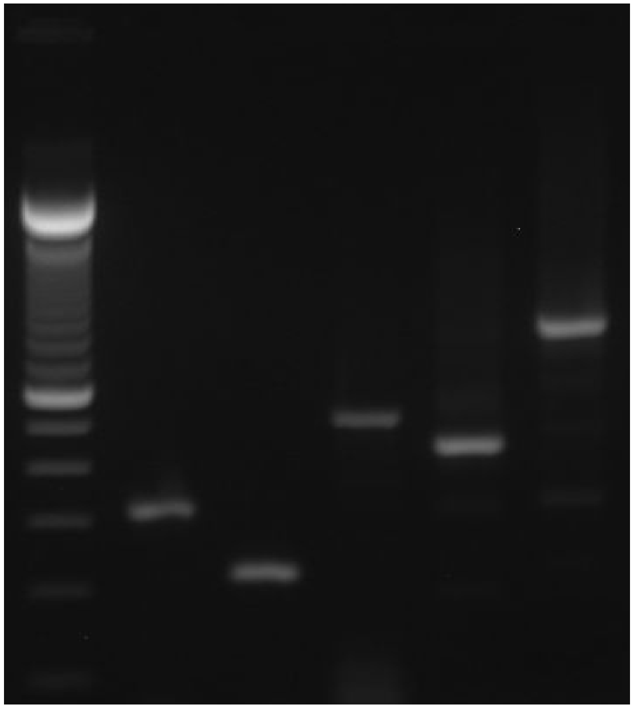

Figure 31. MLVA fingerprint for *P.s. tomato* DC3000 after 2 passages through tomato. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

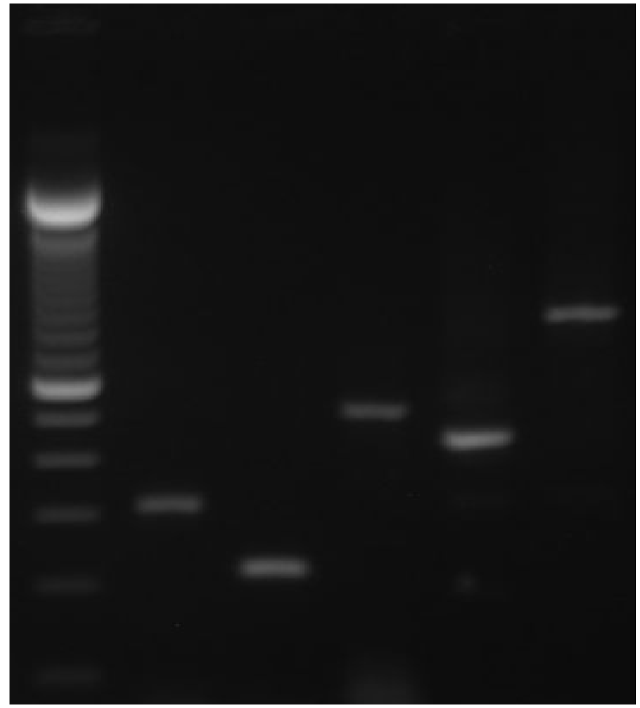

Figure 32. MLVA fingerprint for *P.s. tomato* DC3000 after 3 passages through tomato. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

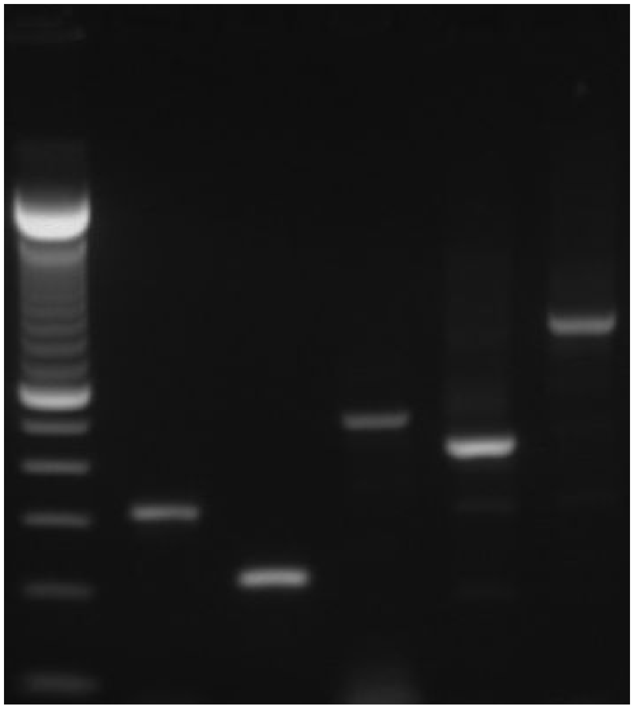

Figure 33. MLVA fingerprint for *P.s. tomato* DC3000 after 4 passages through tomato. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

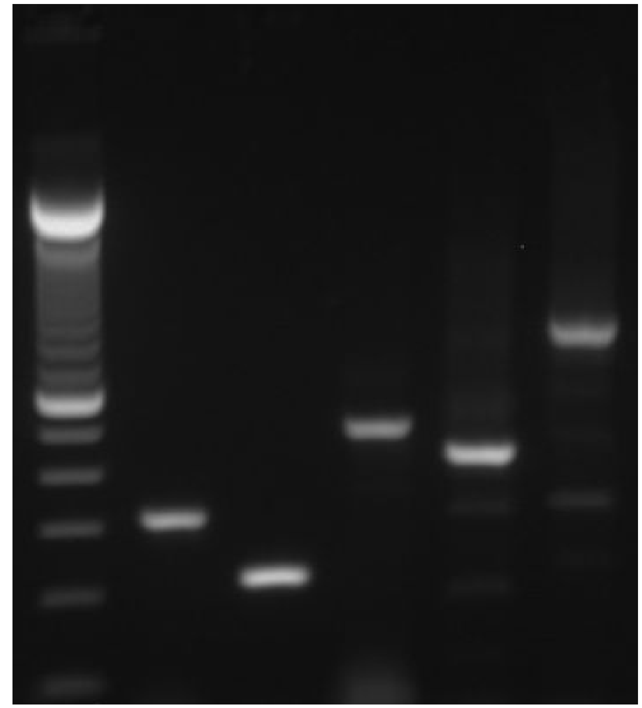

Figure 34. MLVA fingerprint for *P.s. tomato* DC3000 after 5 passages through tomato. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

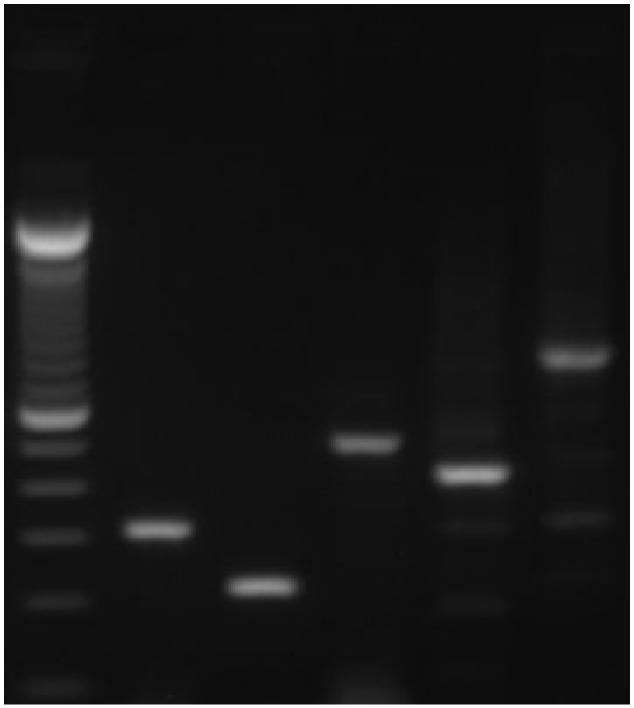

Figure 35. MLVA fingerprint for *P.s. tomato* DC3000 after 6 passages through tomato. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

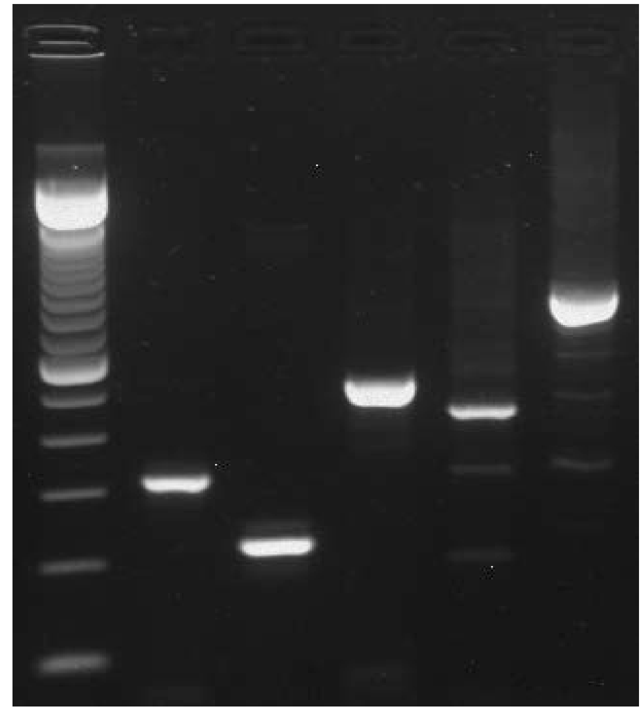

Figure 36. MLVA fingerprint for *P.s. tomato* DC3000 after 7 passages through tomato. Lane 1, 100 bp DNA ladder (Invitrogen, Carlsbad, CA); lane 2, DNA amplified with locus 715 primer; lane 3, DNA amplified with locus 1570 primers; lane 4, DNA amplified with locus 1929 primers; lane 5, DNA amplified with locus 337 primers; lane 6, DNA amplified with locus 919/920 primers.

APPENDIX C

MLST SEQUENCES FOR *P.S. TOMATO* DC3000 SAMPLES

Acn Gene Sequences

Original culture of *P.s. tomato* DC3000 -
AAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGGCTCCATCGGCCC
CATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCCCTATCGCCTACGT
CGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGGCAACCAACTCGGT
GCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGAACAAGCGTGCCG
GTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCTATAACACCATGGA
AGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGAACATCAACATGGG
CGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCTGCAAGCACGACAG
CGACGAAGTCATCACCACCTTCGAAATGAAGACCCCGGTGCTGCTCGACGA
AGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGGTCGCGGCCTGACCA
GCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATTCGACCTGTTCAAGACC
CCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACCCTGGCGCAGAAGAT
GGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCCTGGCACCTACTGCG
AACCGAAAATGACCACCGTCGGTTCCCAGGACACCAC

Sub-culture 11 of *P.s. tomato* DC3000 grown under optimum conditions –
CTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGG
CTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCC
CTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGG
CAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGA
ACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCT
ATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGA
ACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCT
GCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCG
GTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGG
TCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATTC
GACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACC
CTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCC
TGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCA

Sub-culture 22 of *P.s. tomato* DC3000 grown under optimum conditions –
CACGCCCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGT
ACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGG
GCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTA
AATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACG
TGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGA
TCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGT
CTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAA
GGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGAC
CCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCA
TCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGC
ATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTT
TACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCC
GTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCA

Sub-culture 33 of *P.s. tomato* DC3000 grown under optimum conditions –
TACATCCCGCTGCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATC
GTTCCGGACGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAAT
GCGCGGCCAGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAG
GTTCTTCGCGTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACG
ACGTTCCTTACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCA
AAATCGCTCCGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAAT
CGAATTCGATGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCC
TTACGAAGGCAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTT
CGAAATGAAGACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTA
TCCCGCTGATCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTG
GGCCTGCCGGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAG
CACCAAGGGTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCG
TAGCCGGTATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCG
GTTCCCAGGACACCAC

Sub-culture 44 of *P.s. tomato* DC3000 grown under optimum conditions –
TGCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGAC
GTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCA
GGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCG
TAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTA
CGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCC
GATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGAT
GTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGC
AAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAG
ACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGAT
CATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCG
GCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGG
TTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTA
TCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGG
ACAC

Sub-culture 55 of *P.s. tomato* DC3000 grown under optimum conditions –
GCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACG
TACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAG
GGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGT
AAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTAC
GTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCG
ATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATG
TCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCA
AGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGA
CCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATC
ATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGG
CATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTT
TTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATC

CGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGAC
ACCAC

Sub-culture 66 of *P.s. tomato* DC3000 grown under optimum conditions –
CACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGT
ACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGG
GCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTA
AATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACG
TGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGA
TCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGT
CTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAA
GGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGAC
CCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCA
TCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGC
ATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTT
TACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCC
GTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGACA
CCAC

Sub-culture 77 of *P.s. tomato* DC3000 grown under optimum conditions –
CTGGCGGACAAGTTCAGCCTGCGCGTCTTCAAGGTGACGGGCGAAACCAA
CACTGACGACCTGTCCCCGGCACCCGATGGCTGGTCGCGGCCGTACATCC
CCGCGACGCCCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGG
ACGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGC
CAGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCG
CGTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCT
TACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCT
CCGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTC
GATGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAA
GGCAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATG
AAGACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCT
GATCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTG
CCGGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAA
GGGTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCG
GTATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCC
AGGGACACCAC

Sub-culture 88 of *P.s. tomato* DC3000 grown under optimum conditions –
CCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGGCTCC
ATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCCCTAT
CGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGGCAAC
CAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGAACAA
GCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCTATAA
CACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGAACAT
CAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCTGCAA
GCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCGGTGCT

GCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGGTCGCG
GCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATTCGACCTG
TTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACCCTGGC
GCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCCTGGCA
CCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCA

Sub-culture 92 of *P.s. tomato* DC3000 grown under optimum conditions –
CTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGG
CTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCC
CTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGG
CAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGA
ACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCT
ATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGA
ACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCT
GCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCG
GTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGG
TCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATTC
GACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACC
CTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCC
TGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCA

Sub-culture 11 of *P.s. tomato* DC3000 grown under sub-optimal conditions –
TGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGGC
TCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCCC
TATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGGC
AACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGAA
CAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCTA
TAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGAA
CATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCTG
CAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCGGT
GCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGGTC
GCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATTCGA
CCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACCCT
GGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCCTG
GCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCC

Sub-culture 22 of *P.s. tomato* DC3000 grown under sub-optimal conditions –
CACGCCCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGT
ACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGG
GCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTA
AATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACG
TGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGA
TCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGT
CTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAA
GGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGAC
CCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCA

TCGGTCGCGGCCTGACCAGCAAGGCGCGCCGAACTGGGCCTGCCGGC
ATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTT
TACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCC
GTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGACA
CCAC

Sub-culture 33 of *P.s. tomato* DC3000 grown under sub-optimal conditions –
CACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGT
ACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGG
GCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTA
AATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACG
TGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGA
TCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGT
CTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAA
GGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGAC
CCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCA
TCGGTCGCGGCCTGACCAGCAAGGCGCGCCGAACTGGGCCTGCCGGC
ATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTT
TACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCC
GTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGACA
CCACA

Sub-culture 44 of *P.s. tomato* DC3000 grown under sub-optimal conditions –
CTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGG
CTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCC
CTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGG
CAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGA
ACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCT
ATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGA
ACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCT
GCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCG
GTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGG
TCGCGGCCTGACCAGCAAGGCGCGCCGAACTGGGCCTGCCGGCATTC
GACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACC
CTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCC
TGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGACACCAC

Sub-culture 55 of *P.s. tomato* DC3000 grown under sub-optimal conditions –
CTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGG
CTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCC
CTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGG
CAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGA
ACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCT
ATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGA
ACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCT
GCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCG

GTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGG
TCGCGGCCTGACCAGCAAGGCGCGCCGAACTGGGCCTGCCGGCATTC
GACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACC
CTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCC
TGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGGACACCA
C

Sub-culture 66 of *P.s. tomato* DC3000 grown under sub-optimal conditions –
CACGCCCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGT
ACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGG
GCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTA
AATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACG
TGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGA
TCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGT
CTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAA
GGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGAC
CCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCA
TCGGTCGCGGCCTGACCAGCAAGGCGCGCCGAACTGGGCCTGCCGGC
ATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTT
TACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCC
GTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGGA
CACCAC

Sub-culture 77 of *P.s. tomato* DC3000 grown under sub-optimal conditions –
CTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGG
CTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCC
CTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGG
CAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGA
ACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCT
ATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGA
ACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCT
GCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCG
GTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGG
TCGCGGCCTGACCAGCAAGGCGCGCCGAACTGGGCCTGCCGGCATTC
GACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACC
CTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCC
TGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGACACCAC

Sub-culture 88 of *P.s. tomato* DC3000 grown under sub-optimal conditions –
TGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGGC
TCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCCC
TATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGGC
AACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGAA
CAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCTA
TAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGAA
CATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCTG

CAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCGGT
GCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGGTC
GCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATTCGA
CCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACCCT
GGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCCTG
GCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGACACCAC

Sub-culture 92 of *P.s. tomato* DC3000 grown under sub-optimal conditions –
TACATCCCGCTGCACGCCCTGGCCATGCTGAAAATGGCCCGTGACGGCAT
CGTTCCGGACGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAAT
GCGCGGCCAGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAG
GTTCTTCGCGTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACG
ACGTTCCTTACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCA
AAATCGCTCCGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAAT
CGAATTCGATGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCC
TTACGAAGGCAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTT
CGAAATGAAGACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTA
TCCCGCTGATCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTG
GGCCTGCCGGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAG
CACCAAGGGTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCG
TAGCCGGTATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCG
GTTCCCAGGACACCAC

Original mutagenized culture of *P.s. tomato* DC3000 –
TACATCCCGCTGCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATC
GTTCCGGACGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAAT
GCGCGGCCAGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAG
GTTCTTCGCGTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACG
ACGTTCCTTACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCA
AAATCGCTCCGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAAT
CGAATTCGATGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCC
TTACGAAGGCAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTT
CGAAATGAAGACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTA
TCCCGCTGATCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTG
GGCCTGCCGGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAG
CACCAAGGGTTTTACCCTG

Sub-culture 11 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
CTCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAG
GGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTT
CCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATC
GGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCC
GAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTT
CTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTC
GAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGT

CTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCC
GGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCG
GTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATT
CGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTAC
CCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTC
CTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCC

Sub-culture 22 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACG
TACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAG
GGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGT
AAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTAC
GTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCG
ATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATG
TCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCA
AGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGA
CCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATC
ATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGG
CATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTT
TTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATC
CGTCCTGGCACCTACTGCGAACCGAAAA

Sub-culture 33 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGGCT
CCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCCCT
ATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGGCA
ACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGAAC
AAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCTATA
ACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGAACA
TCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCTGCA
AGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCGGTGC
TGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGGTCGC
GGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATTCGACCT
GTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACCCTGG
CGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCCTGGC
ACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGACACC

Sub-culture 44 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACG
TACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAG
GGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGT
AAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTAC
GTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCG

ATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATG
TCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCA
AGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGA
CCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATC
ATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGG
CATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTT
TTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATC
CGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGAC
ACCAC

Sub-culture 55 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
CTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGG
CTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCC
CTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGG
CAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGA
ACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCT
ATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGA
ACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCT
GCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCG
GTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGG
TCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATTC
GACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACC
CTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCC
TGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGACACCAC

Sub-culture 66 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TACATCCCGCTGCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATC
GTTCCGGACGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAAT
GCGCGGCCAGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAG
GTTCTTCGCGTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACG
ACGTTCCTTACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCA
AAATCGCTCCGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAAT
CGAATTCGATGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCC
TTACGAAGGCAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTT
CGAAATGAAGACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTA
TCCCGCTGATCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTG
GGCCTGCCGGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAG
CACCAAGGGTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCG
TAGCCGGTATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCG
GTTCCCAGGACACCAC

Sub-culture 77 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
CTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGG
CTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCC
CTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGG
CAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGA
ACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCT
ATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGA
ACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCT
GCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCG
GTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGG
TCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATTC
GACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACC
CTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCC
TGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAGGACACCAC

Sub-culture 88 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
CCCGTGACGGCATCGTTCCGGACGTACAGGGCTCCATCGGCCCCATGAAG
CAGATCGAAGAAATGCGCGGCCAGGGCTTCCCTATCGCCTACGTCGGTGA
CGTGGTCGGTACAGGTTCTTCGCGTAAATCGGCAACCAACTCGGTGCTGTG
GTTCTTCGGCGACGACGTTCCTTACGTGCCGAACAAGCGTGCCGGTGGTTT
CTGCTTCGGCACCAAAATCGCTCCGATCTTCTATAACACCATGGAAGATGCT
GGCGCTCTGCCAATCGAATTCGATGTCTCGAACATCAACATGGGCGACGTG
ATCGACGTTTACCCTTACGAAGGCAAGGTCTGCAAGCACGACAGCGACGAA
GTCATCACCACCTTCGAAATGAAGACCCCGGTGCTGCTCGACGAAGTTCGC
GCTGGCGGCCGTATCCCGCTGATCATCGGTCGCGGCCTGACCAGCAAGGC
GCGCGCCGAACTGGGCCTGCCGGCATTCGACCTGTTCAAGACCCCGGACC
AGCCAGCCGAAAGCACCAAGGGTTTTACCCTGGCGCAGAAGATGGTCGGC
AAGGCGTGCGGCGTAGCCGGTATCCGTCCTGGCACCTACTGCGAACCGAA
AATGACCACCGTCGGTTCCCAG

Sub-culture 92 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
ATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGACGTACAGGGCTCCATC
GGCCCCATGAAGCAGATCGAAGAAATGCGCGGCCAGGGCTTCCCTATCGC
CTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGCGTAAATCGGCAACCAA
CTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTTACGTGCCGAACAAGCG
TGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTCCGATCTTCTATAACACC
ATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGATGTCTCGAACATCAAC
ATGGGCGACGTGATCGACGTTTACCCTTACGAAGGCAAGGTCTGCAAGCAC
GACAGCGACGAAGTCATCACCACCTTCGAAATGAAGACCCCGGTGCTGCTC
GACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGATCATCGGTCGCGGCCT
GACCAGCAAGGCGCGCGCCGAACTGGGCCTGCCGGCATTCGACCTGTTCA
AGACCCCGGACCAGCCAGCCGAAAGCACCAAGGGTTTTACCCTGGCGCAG

AAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGTATCCGTCCTGGCACCTA
CTGCGAACCGAAAATGACCACCGTCGGTTCCCA

P.s. tomato DC3000 after 1 passage through tomato –
TACATCCCGCTGCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATC
GTTCCGGACGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAAT
GCGCGGCCAGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAG
GTTCTTCGCGTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACG
ACGTTCCTTACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCA
AAATCGCTCCGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAAT
CGAATTCGATGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCC
TTACGAAGGCAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTT
CGAAATGAAGACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTA
TCCCGCTGATCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTG
GGCCTGCCGGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAG
CACCAAGGGTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCG
TAGCCGGTATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCG
GTTCCCAGGACACCACAC

P.s. tomato DC3000 after 2 passages through tomato –
TACATCCCGCTGCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATC
GTTCCGGACGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAAT
GCGCGGCCAGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAG
GTTCTTCGCGTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACG
ACGTTCCTTACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCA
AAATCGCTCCGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAAT
CGAATTCGATGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCC
TTACGAAGGCAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTT
CGAAATGAAGACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTA
TCCCGCTGATCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTG
GGCCTGCCGGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAG
CACCAAGGGTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCG
TAGCCGGTATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCG
GTTCCCAGGACACCACAC

P.s. tomato DC3000 after 3 passages through tomato –
CATCCCGCTGCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGT
TCCGGACGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGC
GCGGCCAGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGT
TCTTCGCGTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGAC
GTTCCTTACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAA
ATCGCTCCGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATC
GAATTCGATGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTT
ACGAAGGCAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTC
GAAATGAAGACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTAT
CCCGCTGATCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGG

GCCTGCCGGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGC
ACCAAGGGTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGT
AGCCGGTATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCG
GTTCCCAGGACACCAC

P.s. tomato DC3000 after 4 passages through tomato –
ACATCCCGCTGCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATC
GTTCCGGACGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAAT
GCGCGGCCAGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAG
GTTCTTCGCGTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACG
ACGTTCCTTACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCA
AAATCGCTCCGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAAT
CGAATTCGATGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCC
TTACGAAGGCAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTT
CGAAATGAAGACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTA
TCCCGCTGATCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTG
GGCCTGCCGGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAG
CACCAAGGGTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCG
TAGCCGGTATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCG
GTTCCCAGGACACCAC

P.s. tomato DC3000 after 5 passages through tomato –
CTGCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGA
CGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCC
AGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGC
GTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTT
ACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTC
CGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGA
TGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGG
CAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAA
GACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGA
TCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCC
GGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGG
GTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGT
ATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAG
GACACCACA

P.s. tomato DC3000 after 6 passages through tomato –
TACATCCCGCTGCACGCTCTGGCCATGCTGAAAATGGCCCGTGACGGCATC
GTTCCGGACGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAAT
GCGCGGCCAGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAG
GTTCTTCGCGTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACG
ACGTTCCTTACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCA
AAATCGCTCCGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAAT
CGAATTCGATGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCC
TTACGAAGGCAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTT

CGAAATGAAGACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTA
TCCCGCTGATCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTG
GGCCTGCCGGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAG
CACCAAGGGTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCG
TAGCCGGTATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCG
GTTCCCAGGACACCA

P.s. tomato DC3000 after 7 passages through tomato –
CTGCACGCCTTGGCCATGCTGAAAATGGCCCGTGACGGCATCGTTCCGGA
CGTACAGGGCTCCATCGGCCCCATGAAGCAGATCGAAGAAATGCGCGGCC
AGGGCTTCCCTATCGCCTACGTCGGTGACGTGGTCGGTACAGGTTCTTCGC
GTAAATCGGCAACCAACTCGGTGCTGTGGTTCTTCGGCGACGACGTTCCTT
ACGTGCCGAACAAGCGTGCCGGTGGTTTCTGCTTCGGCACCAAAATCGCTC
CGATCTTCTATAACACCATGGAAGATGCTGGCGCTCTGCCAATCGAATTCGA
TGTCTCGAACATCAACATGGGCGACGTGATCGACGTTTACCCTTACGAAGG
CAAGGTCTGCAAGCACGACAGCGACGAAGTCATCACCACCTTCGAAATGAA
GACCCCGGTGCTGCTCGACGAAGTTCGCGCTGGCGGCCGTATCCCGCTGA
TCATCGGTCGCGGCCTGACCAGCAAGGCGCGCGCCGAACTGGGCCTGCC
GGCATTCGACCTGTTCAAGACCCCGGACCAGCCAGCCGAAAGCACCAAGG
GTTTTACCCTGGCGCAGAAGATGGTCGGCAAGGCGTGCGGCGTAGCCGGT
ATCCGTCCTGGCACCTACTGCGAACCGAAAATGACCACCGTCGGTTCCCAG
GA

Cts Gene Sequences

Original culture of *P.s. tomato* DC3000 –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 11 of *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 22 of *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 33 of *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 44 of *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 55 of *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 66 of *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT

TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 77 of *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 88 of *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 92 of *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG

TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 11 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 22 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATC

Sub-culture 33 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TGTCACCATCAATGCTATTGATCATCGATGGCGCTGCCCCCGTCGAGCTGC
CAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGTACGCGGTCTG
ACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTCCACGGCCTCT
TGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAATTCTGCTGCAC
CGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTACCTCGAGAC
CTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAACAGAAAGCCC
AGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAACAACTCAAGA
CCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCGTCATGTGCG
GTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGGACATCAATA
ACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCAAGATGCCG
ACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCATGATGTAC

CCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGATGTTCAAC
ACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 44 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAA

Sub-culture 55 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 66 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 77 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 88 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 92 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Original mutagenized culture of *P.s. tomato* DC3000 –
ATCATCGAGGGCGCTGCCCCCGTCGAGCTGCCAATACTGACCGGTACAGT
GGGTCCGGACGTGATCGACGTACGCGGTCTGACCGCCACCGGCCGCTTCA
CATTTGACCCTGGCTTCATGTCCACGGCCTCTTGCGAGTCGAAGATCACCT

ACATTGATGGTGACAACGGAATTCTGCTGCACCGCGGCTACCCGATCGAAC
AACTGGCCGAGCAGTCCGATTACCTCGAGACCTGCTACCTGTTGCTCAACG
GCGAGCTGCCAACCGCCGAACAGAAAGCCCAGTTCGTGGCCGTGGTCAAG
AACCACACGATGGTTCACGAACAACTCAAGACCTTCTTCAACGGCTTTCGCC
GTGACGCCCACCCGATGGCCGTCATGTGCGGTGTAGTCGGCGCCCTGTCG
GCGTTCTACCACGATTCGCTGGACATCAATAACCCGCAGCACCGCGAAATT
TCGGCTGTACGCCTGGTCGCCAAGATGCCGACCCTGGCAGCGATGGTCTA
CAAGTACTCCATGGGCCAACCCATGATGTACCCGCGCAACGACCTCAGCTA
CGCCGAAAACTTCCTGCACATGATGTTCAACACGCCGTGCGAGATCAAACC
GATCAA

Sub-culture 11 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATC

Sub-culture 22 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATC

Sub-culture 33 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT

TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 44 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 55 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 66 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA

CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 77 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 88 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

Sub-culture 92 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC

AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATCAAACCGATCAA

P.s. tomato DC3000 after 1 passage through tomato –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATC

P.s. tomato DC3000 after 2 passages through tomato –
TGTCCACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACG
GAATTCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCC
GATTACCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCC
GAACAGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCAC
GAACAACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATG
GCCGTCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTC
GCTGGACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGT
CGCCAAGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCC
AACCCATGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGC
ACATGATGTTCAACACGCCGTGCGAGT

P.s. tomato DC3000 after 3 passages through tomato –
TGGCTTCATGTCCACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGG
TGACAACGGAATTCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGA
GCAGTCCGATTACCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCC
AACCGCCGAACAGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGA
TGGTTCACGAACAACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCC
ACCCGATGGCCGTCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTAC
CACGATTCGCTGGACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTA
CGCCTGGTCGCCAAGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTC
CATGGGCCAACCCATGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAA
CTTCCTGCACATGATGTTCAACACGCCGTGCGA

P.s. tomato DC3000 after 4 passages through tomato –
TGGCTTCATGTCCACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGG
TGACAACGGAATTCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGA
GCAGTCCGATTACCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCC
AACCGCCGAACAGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGA
TGGTTCACGAACAACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCC
ACCCGATGGCCGTCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTAC
CACGATTCGCTGGACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTA
CGCCTGGTCGCCAAGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTC
CATGGGCCAACCCATGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAA
CTTCCTGCACATGATGTTCAACACGCCGTGCGAG

P.s. tomato DC3000 after 5 passages through tomato –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG
TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAG

P.s. tomato DC3000 after 6 passages though tomato –
TGTCCACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACG
GAATTCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCC
GATTACCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCC
GAACAGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCAC
GAACAACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATG
GCCGTCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTC
GCTGGACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGT
CGCCAAGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCC
AACCCATGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGC
ACATGATGTTCAACACGCCGTG

P.s. tomato DC3000 after 7 passages through tomato –
GTCGAGCTGCCAATACTGACCGGTACAGTGGGTCCGGACGTGATCGACGT
ACGCGGTCTGACCGCCACCGGCCGCTTCACATTTGACCCTGGCTTCATGTC
CACGGCCTCTTGCGAGTCGAAGATCACCTACATTGATGGTGACAACGGAAT
TCTGCTGCACCGCGGCTACCCGATCGAACAACTGGCCGAGCAGTCCGATTA
CCTCGAGACCTGCTACCTGTTGCTCAACGGCGAGCTGCCAACCGCCGAAC
AGAAAGCCCAGTTCGTGGCCGTGGTCAAGAACCACACGATGGTTCACGAAC
AACTCAAGACCTTCTTCAACGGCTTTCGCCGTGACGCCCACCCGATGGCCG

TCATGTGCGGTGTAGTCGGCGCCCTGTCGGCGTTCTACCACGATTCGCTGG
ACATCAATAACCCGCAGCACCGCGAAATTTCGGCTGTACGCCTGGTCGCCA
AGATGCCGACCCTGGCAGCGATGGTCTACAAGTACTCCATGGGCCAACCCA
TGATGTACCCGCGCAACGACCTCAGCTACGCCGAAAACTTCCTGCACATGA
TGTTCAACACGCCGTGCGAGATC

GapA Gene Sequences

Original culture of *P.s. tomato* DC3000 –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAA

Sub-culture 11 of *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTG

Sub-culture 22 of *P.s. tomato* DC3000 grown under optimum conditions –
AACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGA
ATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCG
CCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCC
ACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATC
ATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGT
GCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGC
CTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCG
CGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCC
GAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGA
TGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCA
CCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAA

GCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCA
CACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCA
AAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGT

Sub-culture 33 of *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGACAAC

Sub-culture 44 of *P.s. tomato* DC3000 grown under optimum conditions –
AACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGA
ATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCG
CCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCC
ACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATC
ATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGT
GCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGC
CTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCG
CGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCC
GAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGA
TGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCA
CCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAA
GCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCA
CACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCA
AAGTGAGCGGCAAGTTGCTG

Sub-culture 55 of *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG

GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGT

Sub-culture 66 of *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTG

Sub-culture 77 of *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGAC

Sub-culture 88 of *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC

CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGAC

Sub-culture 92 of *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGT

Sub-culture 11 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGAC

Sub-culture 22 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
AACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGA
ATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCG
CCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCC
ACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATC
ATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGT

GCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGC
CTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCG
CGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCC
GAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGA
TGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCA
CCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAA
GCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCA
CACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCA
AAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGT

Sub-culture 33 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
AACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGA
ATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCG
CCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCC
ACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATC
ATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGT
GCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGC
CTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCG
CGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCC
GAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGA
TGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCA
CCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAA
GCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCA
CACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCA
AAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGT

Sub-culture 44 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGAATGCA
CCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCGCCGG
CGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCCACCA
TCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATCATCT
CCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGTGCTG
CACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGCCTAC
ACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCGCGCG
CGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCCGAAGC
GGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGATGGCT
GTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCACCCTG
AAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAAGCCAG
CCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCACACGA
CTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCAAAGTG
AGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGAC

Sub-culture 55 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG

CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGT

Sub-culture 66 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGAC

Sub-culture 77 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTG

Sub-culture 88 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGT

Sub-culture 92 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTG

Original mutagenized culture of *P.s. tomato* DC3000 –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT

CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTG

Sub-culture 11 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGAATGCA
CCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCGCCGG
CGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCCACCA
TCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATCATCT
CCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGTGCTG
CACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGCCTAC
ACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCGCGCG
CGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCCGAAGC
GGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGATGGCT
GTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCACCCTG
AAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAAGCCAG
CCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCACACGA
CTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCAAAGTG
AGCGGCAAGTTGCTGAAAGTGCTCTCGT

Sub-culture 22 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
AACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGA
ATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCG
CCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCC
ACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATC
ATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGT
GCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGC
CTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCG
CGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCC
GAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGA
TGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCA
CCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAA
GCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCA
CACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCA
AAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGT

Sub-culture 33 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGAATGCA
CCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCGCCGG
CGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCCACCA
TCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATCATCT
CCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGTGCTG
CACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGCCTAC
ACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCGCGCG

CGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCCGAAGC
GGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGATGGCT
GTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCACCCTG
AAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAAGCCAG
CCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCACACGA
CTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCAAAGTG
AGCGGCAAGTTGCTGAAAGTGCTCTCGT

Sub-culture 44 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGACAA

Sub-culture 55 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGACAAC

Sub-culture 66 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
ATTCGCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGT
ATTCGAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACC

TGACCGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCC
GATGCCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCA
CCAGATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCG
CCCAAGTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACC
ATTCATGCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGAC
CCGTACCGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGG
CGCTGCCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCA
CGGGGATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTG
ACCGTCACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGAT
GAAAGAAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCT
GGTTTCACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAAT
CACACCAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGAC

Sub-culture 77 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGACAA

Sub-culture 88 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GCAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTC
GAATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGAC
CGCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATG
CCACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAG
ATCATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAA
GTGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCAT
GCCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTAC
CGCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTG
CCGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGG
GATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGT
CACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAG
AAGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTT
CACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACAC
CAAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGAC

Sub-culture 92 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
CAACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCG
AATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACC
GCCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGC
CACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGAT
CATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAG
TGCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATG
CCTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACC
GCGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGC
CGAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGG
ATGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTC
ACCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGA
AGCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTC
ACACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACC
AAAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGT

P.s. tomato DC3000 after 1 passage through tomato –
CTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGAATGCACCGGCCT
GTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCGCCGGCGCCCGC
AAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCCACCATCGTCTAT
GGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATCATCTCCAGCGC
ATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGTGCTGCACCGTG
AACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGCCTACACCAACG
ACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCGCGCGCGCTCG
GCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCCGAAGCGGTGG
GCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGATGGCTGTTCGC
GTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCACCCTGAAGCGT
GAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAAGCCAGCCAGCA
CTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCACACGACTTCAA
TCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACC

P.s. tomato DC3000 after 2 passages though tomato –
CACCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGA
ATGCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCG
CCGGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCC
ACCATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATC
ATCTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGT
GCTGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGC
CTACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCG
CGCGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCC
GAAGCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGA
TGGCTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCA
CCCTGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAA
GCCAGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCA

CACGACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCA
AAGTGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGT

P.s. tomato DC3000 after 3 passages though tomato –
TGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGAATGCACCGGCCTG
TTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCGCCGGCGCCCGCAA
GGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCCACCATCGTCTATGG
CGTCAACCACGACACGCTGCGCCAGTCGCACCAGATCATCTCCAGCGCATC
GTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGTGCTGCACCGTGAAC
TGGGTATCGAAAGCGGCCTGATGACCACCATTCATGCCTACACCAACGACC
AGAACCTGATCGACGTCTATCACACCGACCCGTACCGCGCGCGCTCGGCC
ACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCCGAAGCGGTGGGCCT
GGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGATGGCTGTTCGCGTGC
CGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCACCCTGAAGCGTGAAA
CCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAAGCCAGCCAGCACTCC
AAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCACACGACTTCAATCAC
AACCCGCTGTCGTCGATTTTCGACGCCAATCACACCAAAGTGAGCGGCAAG
TTGCTGAAAGTGCTCTCGTGGTACGACA

P.s. tomato DC3000 after 4 passages though tomato –
GGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGAATGCA
CCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCGCCGG
CGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCCACCA
TCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATCATCT
CCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGTGCTG
CACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGCCTAC
ACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCGCGCG
CGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCCGAAGC
GGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGATGGCT
GTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCACCCTG
AAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAAGCCAG
CCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCACACGA
CTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCAAAGTG
AGCGGCAAGTTGCTGAAAGTGCTCTCGTGGTACGACA

P.s .tomato DC3000 after 5 passages through tomato –
CTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGAATGCACCGGCCT
GTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCGCCGGCGCCCGC
AAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCCACCATCGTCTAT
GGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATCATCTCCAGCGC
ATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGTGCTGCACCGTG
AACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGCCTACACCAACG
ACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCGCGCGCGCTCG
GCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCCGAAGCGGTGG
GCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGATGGCTGTTCGC
GTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCACCCTGAAGCGT

GAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAAGCCAGCCAGCA
CTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCACACGACTTCAA
TCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCAAAGTGAGCGG
CAAGTTGCTGAAAGTGCTCTCGTGGT

P.s. tomato DC3000 after 6 passages though tomato –
CCCGGCCGAACTGCCGTGGAAAGCGCAGGACATCGACGTGGTATTCGAAT
GCACCGGCCTGTTCACCAGCCGCGACAAGGCTGCCGCGCACCTGACCGCC
GGCGCCCGCAAGGTGATTATCTCAGCACCGGCCAGCGGTGCCGATGCCAC
CATCGTCTATGGCGTCAACCACGACACGCTGCGCCAGTCGCACCAGATCAT
CTCCAGCGCATCGTGCACCACCAACTGCCTGGCCCCGGTCGCCCAAGTGC
TGCACCGTGAACTGGGTATCGAAAGCGGCCTGATGACCACCATTCATGCCT
ACACCAACGACCAGAACCTGATCGACGTCTATCACACCGACCCGTACCGCG
CGCGCTCGGCCACCCAGTCGATGATCCCGAGCAAGACCGGCGCTGCCGAA
GCGGTGGGCCTGGTTCTGCCGGAACTGGCGGGCAAGCTCACGGGGATGG
CTGTTCGCGTGCCGGTGATCAACGTTTCGCTGGTCGACCTGACCGTCACCC
TGAAGCGTGAAACCACGGCCGAAGAAGTCAACGCGCTGATGAAAGAAGCC
AGCCAGCACTCCAAGGTCCTGGGTTACAACACCCTGCCGCTGGTTTCACAC
GACTTCAATCACAACCCGCTGTCGTCGATTTTCGACGCCAATCACACCAAAG
TGAGCGGCAAGTTGCTGAAAGTGCTCTCGTGGT

P.s. tomato DC3000 after 7 passages through tomato –
GGACATCGACGTGGTATTCGAATGCACCGGCCTGTTCACCAGCCGCGACAA
GGCTGCCGCGCACCTGACCGCCGGCGCCCGCAAGGTGATTATCTCAGCAC
CGGCCAGCGGTGCCGATGCCACCATCGTCTATGGCGTCAACCACGACACG
CTGCGCCAGTCGCACCAGATCATCTCCAGCGCATCGTGCACCACCAACTGC
CTGGCCCCGGTCGCCCAAGTGCTGCACCGTGAACTGGGTATCGAAAGCGG
CCTGATGACCACCATTCATGCCTACACCAACGACCAGAACCTGATCGACGT
CTATCACACCGACCCGTACCGCGCGCGCTCGGCCACCCAGTCGATGATCC
CGAGCAAGACCGGCGCTGCCGAAGCGGTGGGCCTGGTTCTGCCGGAACT
GGCGGGCAAGCTCACGGGGATGGCTGTTCGCGTGCCGGTGATCAACGTTT
CGCTGGTCGACCTGACCGTCACCCTGAAGCGTGAAACCACGGCCGAAGAA
GTCAACGCGCTGATGAAAGAAGCCAGCCAGCACTCCAAGGTCCTGGGTTAC
AACACCCTGCCGCTGGTTTCACACGACTTCAATCACAACCCGCTGTCGTCG
ATTTTCGACGCCAATCACACCAAAGTGAGCGGCAAGTTGCTGAAAGTGCTC
TCGTGGTACGACAA

GyrB Gene Sequences

Original culture of *P.s. tomato* DC3000 –
GCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCT
GACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCTACATTCACGGTG
TTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACAGCACCGGCACC
CAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATATCCACTTCAGCT
GGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCCTGAACTCCGGTG
TTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGT
ACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAACACCAACAAGACGC
CGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGATGACGGTATTGGCG
TCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGAGAACCTGTTGTGCT
TCACCAACAACATTCCACAGCGCGATGGCGGCACTCACCTGGTGGGGTTCC
GATCCGCACTGACGCGTAACCTGAACAACTACATCGAGCAGGAAGGTCTGG
CCAAGAAGCACAAGGTCGCGACCACCGGATACGATGCCCGCGAAGGTCTG
ACTG

Sub-culture 11 of *P.s. tomato* DC3000 grown under optimum conditions –
TCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAAC
GCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGG
GAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGC
GAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACC
TTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAA
CTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGC
GGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAA
TACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTC
CAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAG
CTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGG
CGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACA
ACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACC
GGTGACGATGCCCGCG

Sub-culture 22 of *P.s. tomato* DC3000 grown under optimum conditions –
AGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTC
AGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGAC
CTACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGA
CAGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAA
TATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTT
CCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGG
AAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGA
ACACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCG
ATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACG
AGAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTC
ACCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCG
AGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGAT
GCCCGCGAAGGTCTG

Sub-culture 33 of *P.s. tomato* DC3000 grown under optimum conditions –
AGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTC
AGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGAC
CTACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGA
CAGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAA
TATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTT
CCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGG
AAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGA
ACACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCG
ATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACG
AGAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTC
ACCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCG
AGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGAT
GCCCGCGAAGGTCTGACTG

Sub-culture 44 of *P.s. tomato* DC3000 grown under optimum conditions –
TTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAGAACTTCTGTTG
CTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCTACATTCACGGT
GTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACAGCACCGGCAC
CCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATATCCACTTCAGC
TGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCCTGAACTCCGGT
GTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAAGAACTGTTCAA
GTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAACACCAACAAGAC
GCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGATGACGGTATTGG
CGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGAGAACCTGTTGTG
CTTCACCAACAACATTCCACAGCGCGATGGCGGCACTCACCTGGTGGGGTT
CCGATCCGCACTGACGCGTAACCTGAACAACTACATCGAGCAGGAAGGTCT
GGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGATGCCCGCGAAGGT

Sub-culture 55 of *P.s. tomato* DC3000 grown under optimum conditions –
GTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCA
GAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACC
TACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGAC
AGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAAT
ATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTC
CTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGA
AGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAA
CACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGA
TGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGA
GAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTCA
CCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCGA
GCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGATG
CCCGCGAAGGTCTGACTG

Sub-culture 66 of *P.s. tomato* DC3000 grown under optimum conditions –
AGTGTTTCCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTC
GCAGCGGCAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAAC
CGATGAAAATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCA
AGCCATCTGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGG
CCAAGCGGATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCC
TCAAGGACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGT
TTGCGTGCGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAA
GTGTTCCACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCC
CTGCAGTGGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAAC
ATTCCACAGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACT
GACGCGTAACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCA
CAAGGTCGCGACCACCGGTGACGATGCCCGCGAAGGTCTGACTGC

Sub-culture 77 of *P.s. tomato* DC3000 grown under optimum conditions –
TGTAGGTGTTTCCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTG
CGTCGCAGCGGCAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAA
GAACCGATGAAAATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCA
CTTCAAGCCATCTGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATT
CTGGCCAAGCGGATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATC
GTCCTCAAGGACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGG
CGGTTTGCGTGCGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAA
CGAAGTGTTCCACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGAT
TGCCCTGCAGTGGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAA
CAACATTCCACAGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCG
CACTGACGCGTAACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGA
AGCACAAGGTCGCGACCACCGGTGACGATGCCCGCGAAGGTCTGACTG

Sub-culture 88 of *P.s. tomato* DC3000 grown under optimum conditions –
GTTCGATGACAACTCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGT
TTCCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAG
CGGCAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAACCGAT
GAAAATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCC
ATCTGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAG
CGGATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAG
GACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCG
TGCGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTT
CCACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCA
GTGGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCC
ACAGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGC
GTAACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGG
TCGCGACCACCGGTGACGATGCCCGCGAAGGTCTG

Sub-culture 92 of *P.s. tomato* DC3000 grown under optimum conditions –
TCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAAC
GCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGG

GAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGC
GAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACC
TTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAA
CTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGC
GGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAA
TACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTC
CAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAG
CTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGG
CGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACA
ACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACC
GGTGACGATGCCCGTGAAGGTCTGACTG

Sub-culture 11 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAG
AACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCT
ACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACA
GCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATA
TCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCC
TGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAA
GAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAAC
ACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGAT
GACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGA
GAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTCA
CCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCGA
GCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGATG
C

Sub-culture 22 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAG
AACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCT
ACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACA
GCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATA
TCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCC
TGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAA
GAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAAC
ACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGAT
GACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGA
GAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTCA
CCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCGA
GCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGT

Sub-culture 33 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAG
AACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCT
ACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACA
GCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATA

TCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCC
TGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAA
GAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAAC
ACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGAT
GACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGA
GAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTCA
CCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCGA
GCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGATG
CCCGCGAAGGTCTGACTG

Sub-culture 44 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAG
AACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCT
ACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACA
GCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATA
TCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCC
TGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAA
GAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAAC
ACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGAT
GACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGA
GAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTCA
CCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCGA
GCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGATG
CCCGCGAAGGTCTGACTG

Sub-culture 55 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAG
AACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCT
ACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACA
GCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATA
TCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCC
TGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAA
GAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAAC
ACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGAT
GACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGA
GAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTCA
CCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCGA
GCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGATG
CCCGCGAAGGTCTGACTG

Sub-culture 66 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAGAACTT
CTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCTACATT
CACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACAGCACC
GGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATATCCACT
TCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCCTGAACT

CCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAAGAACTG
TTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAACACCAAC
AAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGATGACGGT
ATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGAGAACCTG
TTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTCACCTGGTG
GGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCGAGCAGGAA
GGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGATGCCCGCGA
AGGTCTGACTG

Sub-culture 77 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
ATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAGA
ACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCTA
CATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACAG
CACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATATC
CACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCCTG
AACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAAGA
ACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAACAC
CAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGATGA
CGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGAGAA
CCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTCACCT
GGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCGAGCA
GGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGATGCCC
GCGAAGGTCTGACTG

Sub-culture 88 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAAC
GCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGG
GAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGC
GAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACC
TTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAA
CTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGC
GGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAA
TACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTC
CAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAG
CTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGG
CGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACA
ACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACC
GGTGACGATGCCCG

Sub-culture 92 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAAC
GCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGG
GAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGC
GAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACC
TTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAA
CTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGC

GGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAA
TACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTC
CAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAG
CTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGG
CGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACA
ACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACC
GGTGACGATGCCCGCGAA

Original mutagenized culture of *P.s. tomato* DC3000 –
AAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTT
TCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAG
ACCTACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGC
GACAGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAG
AATATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCG
TTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAG
GAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTG
AACACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGC
GATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAAC
GAGAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACT
CACCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATC
GAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGA
TGCCCGCGAAGGTCTGACTG

Sub-culture 11 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAGAA
CTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCTAC
ATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACAGC
ACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATATCC
ACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCCTGA
ACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAAGAA
CTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAACACC
AACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGATGAC
GGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGAGAAC
CTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTCACCTG
GTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCGAGCAG
GAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGATGCCCG
CGAAGGTCT

Sub-culture 22 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
AGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTC
AGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGAC
CTACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGA
CAGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAA
TATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTT

CCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGG
AAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGA
ACACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCG
ATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACG
AGAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACTC
ACCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATCG
AGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGA

Sub-culture 33 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCT
GACAGTGCGTCGCAGCGGCAAGATCTGGGAACAGACCTACATTCACGGTG
TTCCACAAGAACCGATGAAAATCGTCGGCGAAAGCGACAGCACCGGCACC
CAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAGAATATCCACTTCAGCT
GGGACATTCTGGCCAAGCGGATCCGTGAACTGTCGTTCCTGAACTCCGGTG
TTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGT
ACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTGAACACCAACAAGACGC
CGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGCGATGACGGTATTGGCG
TCGAGATTGCCCTGCAGTGGAACGACAGCTTCAACGAGAACCTGTTGTGCT
TCACCAACAACATTCCACAGCGCGATGGCGGCACTCACCTGGTGGGGTTCC
GATCCGCACTGACGCGTAACCTGAACAACTACATCGAGCAGGAAGGTCTGG
CCAAGAAGCACAAGGTCGCGACCACCGGTGACGATGCCCGCGAAGGTCTG
A

Sub-culture 44 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
AAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCAACGCCCTT
TCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCTGGGAACAG
ACCTACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCGGCGAAAGC
GACAGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGACCTTCAAG
AATATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTGAACTGTCG
TTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTAGCGGCAAG
GAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTGAATACCTG
AACACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGTCCAGCGC
GATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACAGCTTCAAC
GAGAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATGGCGGCACT
CACCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAACAACTACATC
GAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCACCGGTGACGA
TGCCCGCGAAGGTCTGACTG

Sub-culture 55 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TATCCTACAAATATATCCGGCGGTTTGCACGGTGTAGGTGTTTCCGTGGTCA
ACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCAAGATCT
GGGAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGAAAATCGTCG
GCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCATCTGCTGAGA

CCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGCGGATCCGTG
AACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACGAGCGTA
GCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCGTTCGTTG
AATACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTCCACTTCAATGT
CCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGGAACGACA
GCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCACAGCGCGATG
GCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGTAACCTGAAC
AACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGCGACCAC
CGGTGACGATGCCCGCGAAGGTCTGACTG

Sub-culture 66 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TGTAGGTGTTTCCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTG
CGTCGCAGCGGCAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAA
GAACCGATGAAAATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCA
CTTCAAGCCATCTGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATT
CTGGCCAAGCGGATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATC
GTCCTCAAGGACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGG
CGGTTTGCGTGCGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAA
CGAAGTGTTCCACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGAT
TGCCCTGCAGTGGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAA
CAACATTCCACAGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCG
CACTGACGCGTAACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGA
AGCACAAGGTCGCGACCACCGGTGACGATGCCCGCGAAGGTCTGACTG

Sub-culture 77 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GTAGGTGTTTCCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGC
GTCGCAGCGGCAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAG
AACCGATGAAAATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACT
TCAAGCCATCTGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCT
GGCCAAGCGGATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGT
CCTCAAGGACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCG
GTTTGCGTGCGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACG
AAGTGTTCCACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTG
CCCTGCAGTGGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACA
ACATTCCACAGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCA
CTGACGCGTAACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAG
CACAAGGTCGCGACCACCGGTGACGATGCCCGCGAAGGTCTGACTG

Sub-culture 88 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TCGATGACAACTCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTT
CCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCG
GCAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGA
AAATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCAT

CTGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGC
GGATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGG
ACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGT
GCGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTC
CACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAG
TGGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCAC
AGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGT
AACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTC
GCGACCACC

Sub-culture 92 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
CGATGACAACTCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTTC
CGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGG
CAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGAA
AATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCATC
TGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGCG
GATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGA
CGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTG
CGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTCC
ACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAGT
GGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCAC
AGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGT
AACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTC
GCGACCACCGGTGACGATGCCCGCGAAGGTCTG

P.s. tomato DC3000 after 1 passage though tomato –
CGATGACAACTCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTTC
CGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGG
CAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGAA
AATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCATC
TGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGCG
GATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGA
CGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTG
CGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTCC
ACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAGT
GGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCAC
AGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGT
AACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTC
GCGACCACCGGTGACGATGCCCGCGAAGGTCTG

P.s. tomato DC3000 after 2 passages though tomato –
GATGACAACTCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCC
GTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGC
AAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGAAA

ATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCATCT
GCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGCGG
ATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGAC
GAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGC
GTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTCCA
CTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAGTG
GAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCACA
GCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGTA
ACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCG
CGACCACCGGTGACGATGCCCGCGAAGGT

P.s. tomato DC3000 after 3 passages though tomato –
ATGACAACTCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTTCCG
TGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCGGCA
AGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGAAAA
TCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCATCTG
CTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGCGGA
TCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGGACG
AGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGTGCG
TTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTCCAC
TTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAGTGG
AACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCACAGC
GCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGTAAC
CTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTCGC
GACCACCGGTGACGATGCCCGCGAAGGTCTG

P.s. tomato DC3000 after 4 passages through tomato –
TCGATGACAACTCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTT
CCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCG
GCAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGA
AAATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCAT
CTGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGC
GGATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGG
ACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGT
GCGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTC
CACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAG
TGGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCAC
AGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGT
AACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTC
GCGACCACCGGTGACGATGCCCGCGAAGGTCTGAC

P.s. tomato DC3000 after 5 passages though tomato –
TCGATGACAACTCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTT
CCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCG
GCAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGA
AAATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCAT

CTGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGC
GGATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGG
ACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGT
GCGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTC
CACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAG
TGGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCAC
AGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGT
AACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTC
GCGACCACCGGTGACGATGCCCGCGAA

P.s. tomato DC3000 after 6 passages though tomato –
TCGATGACAACTCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGTGTTT
CCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGCAGCG
GCAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAACCGATGA
AAATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAGCCAT
CTGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCAAGC
GGATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCAAGG
ACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTGCGT
GCGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAAGTGTTC
CACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTGCAG
TGGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATTCCAC
AGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGACGCGT
AACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAAGGTC
GCGACCACCGGTGACGATGCCCGCGAAGG

P.s. tomato DC3000 after 7 passages through tomato –
AAGTTCGATGACAACTCCTACAAAGTATCCGGCGGTTTGCACGGTGTAGGT
GTTTCCGTGGTCAACGCCCTTTCAGAACTTCTGTTGCTGACAGTGCGTCGC
AGCGGCAAGATCTGGGAACAGACCTACATTCACGGTGTTCCACAAGAACCG
ATGAAAATCGTCGGCGAAAGCGACAGCACCGGCACCCAGATTCACTTCAAG
CCATCTGCTGAGACCTTCAAGAATATCCACTTCAGCTGGGACATTCTGGCCA
AGCGGATCCGTGAACTGTCGTTCCTGAACTCCGGTGTTGGCATCGTCCTCA
AGGACGAGCGTAGCGGCAAGGAAGAACTGTTCAAGTACGAAGGCGGTTTG
CGTGCGTTCGTTGAATACCTGAACACCAACAAGACGCCGGTCAACGAAGTG
TTCCACTTCAATGTCCAGCGCGATGACGGTATTGGCGTCGAGATTGCCCTG
CAGTGGAACGACAGCTTCAACGAGAACCTGTTGTGCTTCACCAACAACATT
CCACAGCGCGATGGCGGCACTCACCTGGTGGGGTTCCGATCCGCACTGAC
GCGTAACCTGAACAACTACATCGAGCAGGAAGGTCTGGCCAAGAAGCACAA
GGTCGCGACCACCGGTGACGATGCCCGCGAAGGTCTG

Pfk Gene Sequences

Original culture of *P.s. tomato* DC3000 –
TGGGCCAGGTCAACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAG
GGCCTCAACGTGGCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGT
TGCCGGTTTTCTCGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGA
GCGTCGCCACTTTGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCA
GCAACATCAAGATGGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTC
CTGGGCCGCAGGTCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGT
GGAACAGATCGCCCCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGC
CGCGCGGCGTCACGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAG
GGCCTGGGTCTGAAGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTG
CCGGTCTTGCTGCCGGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTG
GCCGACGCGCTCGACGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGC
GGCTGCGCGCCTGCATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGG
GTTCCGAAGGCGTTCACTGGTTCA

Sub-culture 11 of *P.s. tomato* DC3000 grown under optimum conditions –
TGGGCCAGGTCAACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAG
GGCCTCAACGTGGCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGT
TGCCGGTTTTCTCGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGA
GCGTCGCCACTTTGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCA
GCAACATCAAGATGGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTC
CTGGGCCGCAGGTCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGT
GGAACAGATCGCCCCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGC
CGCGCGGCGTCACGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAG
GGCCTGGGTCTGAAGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTG
CCGGTCTTGCTGCCGGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTG
GCCGACGCGCTCGACGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGC
GGCTGCGCGCCTGCATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGG
GTTCCGAAGGCGTTCACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTG
CCGCCCAAGGTCACGGTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCT
GGCGGGCATGGTCCACGGCCTGATCGGCGGTCATGAGCCACAGAAGATTT
TGCGCACCGCCACGGCCATCGCCGCCATGGCCGTGACCCAGATCGGCTTC

Sub-culture 22 of *P.s. tomato* DC3000 grown under optimum conditions –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC

GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCA

Sub-culture 33 of *P.s. tomato* DC3000 grown under optimum conditions –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCAGATCGGCTTC

Sub-culture 44 of *P.s. tomato* DC3000 grown under optimum conditions –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCAGATCGGCTTCGGCATA

Sub-culture 55 of *P.s. tomato* DC3000 grown under optimum conditions –
CCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCAACCGCAGCA
ATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGCGCAGGTG
CTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCGGCATCGAC
AATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTGTCGACGAG
TTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATGGCCGAAAG
CAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGGTCAGCGAAG
CGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCCCCGGTTTC
GACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCACGCCCGAGT
GGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAAGGTGGCG
CTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCGGGCCGTG
GCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGACGCGCCGA
TCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCATGCGCAG
GGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCACTGGTTC
AGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACGGTGGCCAG
CACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCACGGCCTGA
TCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGGCCATCGCC
GCCATGGCCGTGACCCA

Sub-culture 66 of *P.s. tomato* DC3000 grown under optimum conditions –
TGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCAACCGCAGCAAT
GCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGCGCAGGTGCT
GGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCGGCATCGACAA
TCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTGTCGACGAGTT
TGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATGGCCGAAAGCA
GTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGGTCAGCGAAGCG
GCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCCCCGGTTTCGA
CGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCACGCCCGAGTGG
CTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAAGGTGGCGCTG
GACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCGGGCCGTGGCT
GATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGACGCGCCGATCA
TTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCATGCGCAGGGT
ATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCACTGGTTCAGC
CCGAGTGTGGCGCTGCA

Sub-culture 77 of *P.s. tomato* DC3000 grown under optimum conditions –
CGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC

GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCAGATCGG

Sub-culture 88 of *P.s. tomato* DC3000 grown under optimum conditions –
CGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCAGATCGG

Sub-culture 92 of *P.s. tomato* DC3000 grown under optimum conditions –
GCGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGCCAGGTC
AACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGT
GGCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTC
TCGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACT
TTGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGA
TGGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAG
GTCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGC
CCCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTC
ACGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTG
AAGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGC
CGGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCG
ACGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTG
CATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTT
CACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCAC
GGTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTC
CACGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCAC
GGCCATCGCCGCCATGGCCGTGACCCAGATCGG

Sub-culture 11 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCAACCGCAGCAAT
GCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGCGCAGGTGCT
GGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCGGCATCGACAA
TCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTGTCGACGAGTT
TGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATGGCCGAAAGCA
GTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGGTCAGCGAAGCG
GCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCCCCGGTTTCGA
CGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCACGCCCGAGTGG
CTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAAGGTGGCGCTG
GACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCGGGCCGTGGCT
GATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGACGCGCCGATCA
TTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCATGCGCAGGGT
ATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCACTGGTTCAGC
CCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACGGTGGCCAGCAC
GGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCACGGCCTGATCG
GCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGGCCATCGCCGCC
ATGGCCGTGACCCAGATCGGCTTC

Sub-culture 22 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCA

Sub-culture 33 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCAAC
CGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGC
GCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCG
GCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTG
TCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATG
GCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGGT
CAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCC

CCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCAC
GCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAA
GGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCG
GGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGAC
GCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCA
TGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCA
CTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACGG
TGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCAC
GGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGGC
CATCGCCGCCATGGCCGTGACCCAGATCGGCTTCGGCAT

Sub-culture 44 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCA

Sub-culture 55 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCAAC
CGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGC
GCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCG
GCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTG
TCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATG
GCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAGGT
CAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCC
CCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCAC
GCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAA
GGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCG
GGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGAC
GCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCA
TGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCA
CTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACGG
TGGCCA

Sub-culture 66 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGCCAGGTCAAC
CGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGC
GCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCG
GCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTG
TCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATG
GCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAGGT
CAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCC
CCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCAC
GCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAA
GGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCG
GGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGAC
GCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCA
TGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCA
CTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACGG
TGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCAC
GGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGGC
CATCGCCGCCATGGCCGTGACCCAGATCGG

Sub-culture 77 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CGGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGCAACTGGCCAGGTC
AACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGT
GGCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTC
TCGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACT
TTGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGA
TGGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAG
GTCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGC
CCCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTC
ACGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTG
AAGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGC
CGGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCG
ACGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTG
CATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTT
CACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCAC
GGTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTC
CACGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCAC
GGCCATCGCCGCCATGGCCGTGACCCAGATCGGCTTCGGCA

Sub-culture 88 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGCCAGGTCAAC
CGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGC
GCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCG
GCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTG
TCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATG
GCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAGGT
CAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCC

CCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCAC
GCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAA
GGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCG
GGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGAC
GCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCA
TGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCA
CTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACGG
TGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCAC
GGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGGC
CATCGCCGCCATGG

Sub-culture 92 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCAAC
CGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGC
GCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCG
GCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTG
TCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATG
GCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGGT
CAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCC
CCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCAC
GCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAA
GGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCG
GGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGAC
GCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCA
TGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCA
CTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACGG
TGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCAC
GGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGGC
CATCGCCGCCATGGCCGTGACCCAGATCGGCTTC

Original mutagenized culture of *P.s. tomato* DC3000 –
CAGGTCAACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCT
CAACGTGGCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCG
GTTTTCTCGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTC
GCCACTTTGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAAC
ATCAAGATGGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGG
GCCGCAGGTCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAA
CAGATCGCCCCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGC
GCGGCGTCACGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGC
CTGGGTCTGAAGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCG
GTCTTGCTGCCGGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCC
GACGCGCTCGACGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGC
TGCGCGCCTGCATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTT
CCGAAGGCGTTCACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCG
CCCAAGGTCACGGTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGC
GGGCATGGTCCACGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGC

GCACCGCCACGGCCATCGCCGCCATGGCCGTGACCCAGATCGGCTTCGGC
AT

Sub-culture 11 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TGGGCCAGGTCAACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAG
GGCCTCAACGTGGCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGT
TGCCGGTTTTCTCGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGA
GCGTCGCCACTTTGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCA
GCAACATCAAGATGGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTC
CTGGGCCGCAGGTCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGT
GGAACAGATCGCCCCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGC
CGCGCGGCGTCACGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAG
GGCCTGGGTCTGAAGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTG
CCGGTCTTGCTGCCGGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTG
GCCGACGCGCTCGACGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGC
GGCTGCGCGCCTGCATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGG
GTTCCGAAGGCGTTCACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTG
CCGCCCAAGGTCACGGTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCT
GGCGGGCATGGTCCACGGCCTGATCGGCGGTCATGAGCCACAGAAGATTT
TGCGCACCGCCACGGCCATCGCCGCCATGGCCGTGACCCAGATCGGC

Sub-culture 22 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
CGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCAAC
CGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGC
GCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCG
GCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTG
TCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATG
GCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGGT
CAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCC
CCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCAC
GCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAA
GGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCG
GGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGAC
GCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCA
TGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCA
CTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACGG
TGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCAC
GGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGGC
CATCGCCGCCATGGCCGTGACCCAGATCGGCTTC

Sub-culture 33 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG

GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCAGATCGGCTTCGGCATA

Sub-culture 44 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCA

Sub-culture 55 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
CGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA

CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCC

Sub-culture 66 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCAGATCGGCTTC

Sub-culture 77 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCAACCGCAGCAAT
GCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGCGCAGGTGCT
GGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCGGCATCGACAA
TCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTGTCGACGAGTT
TGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATGGCCGAAAGCA
GTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGGTCAGCGAAGCG
GCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCCCCGGTTTCGA
CGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCACGCCCGAGTGG
CTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAAGGTGGCGCTG
GACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCGGGCCGTGGCT
GATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGACGCGCCGATCA
TTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCATGCGCAGGGT
ATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCACTGGTTCAGC
CCGAGTGTGGCGCTGCACTCGCTGCCGCCCAA

Sub-culture 88 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
CGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCAAC
CGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTGGC
GCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCTCG
GCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTTTG
TCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGATG
GCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGGT
CAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCCC
CCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCAC
GCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGAA
GGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCCG
GGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGAC
GCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGCA
TGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTCA
CTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACGG
TGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCAC
GGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGGC
CATCGCCGCCATGGCCGTGACCCA

Sub-culture 92 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCC

P.s. tomato DC3000 after 1 passage through tomato –
ACCATGAACCCGGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACT
GGGCCAGGTCAACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGG
GCCTCAACGTGGCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTT
GCCGGTTTTCTCGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAG
CGTCGCCACTTTGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAG

CAACATCAAGATGGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCC
TGGGCCGCAGGTCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTG
GAACAGATCGCCCCCGGTTTCGACGTGGTGGTGGCGGGCAGCCTGCC
GCGCGGCGTCACGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGG
GCCTGGGTCTGAAGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCC
GGTCTTGCTGCCGGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGC
CGACGCGCTCGACGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGG
CTGCGCGCCTGCATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGT
TCCGAAGGCGTTCACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCC
GCCCAAGGTCACGGTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGG
CGGGCATGGTCCACGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTG
CGCACCGCCACGGCCATCGCCGCCATGGCCGTGACCCAGA

P.s. tomato DC3000 after 2 passages through tomato –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCAGATC

P. s. tomato DC3000 after 3 passages through tomato –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC

ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCA

P.s. tomato DC3000 after 4 passages through tomato –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCAGATCG

P.s. tomato DC3000 after 5 passages through tomato –
CGGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTC
AACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGT
GGCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTC
TCGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACT
TTGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGA
TGGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGGCCGCAG
GTCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGC
CCCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTC
ACGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTG
AAGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGC
CGGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCG
ACGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTG
CATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTT
CACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCAC
GGTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTC
CACGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCAC
GGCCATCGCCGCCATGGCCGTGACCCAGATC

P.s. tomato DC3000 after 6 passages through tomato –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG

GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCAGATC

P.s. tomato DC3000 after 7 passages through tomato –
GGCGCTGGACCTGACGCTACAGTTGGGGCAGTTGGAACTGGGCCAGGTCA
ACCGCAGCAATGCAATGCTCACTCACGCAGCGGGCAAGGGCCTCAACGTG
GCGCAGGTGCTGGCTGACCTGGGCCATGAGCTGACGGTTGCCGGTTTTCT
CGGCATCGACAATCAGCAGGCGTTCGAGGCGTTGTTCGAGCGTCGCCACTT
TGTCGACGAGTTTGTGCGTGTGCCAGGGGAAACCCGCAGCAACATCAAGAT
GGCCGAAAGCAGTGGCCGCATCACTGACCTCAACGGTCCTGGCCGCAGG
TCAGCGAAGCGGCGCAGCAAGCGTTGTTCGCCCGCGTGGAACAGATCGCC
CCCGGTTTCGACGTGGTGGTGGTGGCGGGCAGCCTGCCGCGCGGCGTCA
CGCCCGAGTGGCTGCAAAAGCTTTTGCTGATGCTCAAGGGCCTGGGTCTGA
AGGTGGCGCTGGACAGCAGCGGCCTGGCCTTGCGTGCCGGTCTTGCTGCC
GGGCCGTGGCTGATCAAGCCCAATACCGAGGAACTGGCCGACGCGCTCGA
CGCGCCGATCATTTCCATCGCCGCGCAAGCTGAGGCGGCTGCGCGCCTGC
ATGCGCAGGGTATCGAACACGTGGTGATTTCGCAGGGTTCCGAAGGCGTTC
ACTGGTTCAGCCCGAGTGTGGCGCTGCACTCGCTGCCGCCCAAGGTCACG
GTGGCCAGCACGGTAGGTGCAGGGGATTCGCTGCTGGCGGGCATGGTCCA
CGGCCTGATCGGCGGTCATGAGCCACAGAAGATTTTGCGCACCGCCACGG
CCATCGCCGCCATGGCCGTGACCCAGATCGGCTTCGGC

Pgi Gene Sequences

Original culture of *P.s. tomato* DC3000 –
GAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTTACGCTCAGCAGC
GCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACCGCCGAAACCCGT
GACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAAGGACGCGATCAA
GGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGGTCGCCCGGCGC
TGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGAAAGTCAACGGC
GTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGATGACCGAGCTG
GTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACCGAAAAGCCGAT
CACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCTCGGCCCCGAGC
TGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTGTGCGTTGCCAT
TACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGTCCATGAAGATC
CGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTTCAATACCCTCG
AAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCTGG

Sub-culture 11 of *P.s. tomato* DC3000 grown under optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCT
GG

Sub-culture 22 of *P.s. tomato* DC3000 grown under optimum conditions –
CAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTTAC
GCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACCGC
CGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAAGG
ACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGGTC
GCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGAAA
GTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGATG
ACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACCGA
AAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCTCG
GCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTGTG
CGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGTCC
ATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTTCA
ATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCTG
G

Sub-culture 33 of *P.s. tomato* DC3000 grown under optimum conditions –
TTCAAGGACTTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTC
AGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAAC
CTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGT
GGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTC
ATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCG
ACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGC
TTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGC
GGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGG
CTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGC
ACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCC
ATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTC
GAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGC
CTGGTACCTGG

Sub-culture 44 of *P.s. tomato* DC3000 grown under optimum conditions –
TTCAAGGACTTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTC
AGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAAC
CTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGT
GGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTC
ATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCG
ACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGC
TTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGC
GGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGG
CTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGC
ACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCC
ATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTC
GAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGC
CTGGTACCTGGCCCA

Sub-culture 55 of *P.s. tomato* DC3000 grown under optimum conditions –
TTCAAGGACTTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTC
AGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAAC
CTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGT
GGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTC
ATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCG
ACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGC
TTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGC
GGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGG
CTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGC
ACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCC
ATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTC
GAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGC
CTGGTACCTGGCCCA

Sub-culture 66 of *P.s. tomato* DC3000 grown under optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCT
GGCC

Sub-culture 77 of *P.s. tomato* DC3000 grown under optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCT
GG

Sub-culture 88 of *P.s. tomato* DC3000 grown under optimum conditions –
TTCAAGGACTTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTC
AGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAAC
CTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGT
GGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTC
ATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCG
ACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGC
TTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGC
GGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGG
CTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGC
ACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCC
ATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTC
GAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGC
CTGGTACCTGGCCCA

Sub-culture 92 of *P.s. tomato* DC3000 grown under optimum conditions –
TTCAAGGACTTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTC
AGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAAC
CTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGT
GGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTC
ATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCG
ACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGC
TTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGC
GGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGG
CTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGC
ACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCC
ATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTC
GAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGC
CTGGTACCTGGCCCA

Sub-culture 11 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTTAC
GCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACCGC
CGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAAGG
ACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGGTC
GCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGAAA
GTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGATG
ACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACCGA
AAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCTCG
GCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTGTG
CGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGTCC
ATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTTCA
ATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCTG
G

Sub-culture 22 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCT
GGCCCA

Sub-culture 33 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TTCAAGGACTTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTC
AGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAAC
CTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGT
GGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTC
ATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCG
ACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGC
TTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGC
GGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGG
CTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGC
ACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCC
ATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTC
GAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGC
CTGGTACCTG

Sub-culture 44 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCT
GG

Sub-culture 55 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCT
G

Sub-culture 66 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TTCAAGGACTTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTC
AGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAAC
CTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGT
GGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTC
ATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCG
ACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGC
TTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGC
GGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGG
CTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGC
ACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCC
ATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTC
GAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGC
CTGGTACCTGGCCCA

Sub-culture 77 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCT
GG

Sub-culture 88 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
ACGGATGATCCCAAGCGCTTCAGCCAGTTTACGCTCAGCAGCGCCGGTCTG
TTTCTGGACTACTCGAAAAACCTGATCACCGCCGAAACCCGTGACCTGCTG
GTTGCGCTGGCCGGTGAAGTGGGCCTCAAGGACGCGATCAAGGCTCAATA
CTATGGCGAGCTGGTCAACTCATCCGAAGGTCGCCCGGCGCTGCACACCG
CATTGCGTCGTCCGGTAGGCGACAAGCTGAAAGTCAACGGCGTCGATGTG
ATACCCGACGTTCACCGCGTGCTTAACCAGATGACCGAGCTGGTCGGCCG
CATCCACGACGGCCTGTGGCGCGGTTACACCGAAAAGCCGATCACCGACG
TGGTGAACATCGGCATCGGCGGCTCGTTCCTCGGCCCCGAGCTGGTTTCC
GAAGCGCTGGTGGCGTACGCGCACAAGGGTGTGCGTTGCCATTACCTGGC
AAACATCGATGGCAGTGAGTTCCATGAACTGTCCATGAAGATCCGCGCCGA
AACCACACTCTTCATCGTTTCGTCGAAATCCTTCAATACCCTCGAAACCCTG
AAAAATGCCCAGGCCGCGCGCGCCTGGTACCTGGCCCA

Sub-culture 92 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTTACGCTCAGCAGC
GCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACCGCCGAAACCCGT
GACCTGCTGGTTGCGCTGGCCGGTGAAGTGGCCTCAAGGACGCGATCAA
GGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGGTCGCCCGGCGC
TGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGAAAGTCAACGGC
GTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGATGACCGAGCTG
GTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACCGAAAAGCCGAT
CACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCTCGGCCCCGAGC
TGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTGTGCGTTGCCAT
TACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGTCCATGAAGATC
CGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTTCAATACCCTCG
AAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCTGGCCCAGGGC
GGCTCGA

Original mutagenized culture of *P.s. tomato* DC3000 –
CAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTTAC
GCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACCGC
CGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGCCTCAAGG
ACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGGTC
GCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGAAA
GTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGATG
ACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACCGA
AAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCTCG
GCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTGTG
CGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGTCC
ATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTTCA
ATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCTG
G

Sub-culture 11 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
CAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTTAC
GCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACCGC
CGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGCCTCAAGG
ACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGGTC
GCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGAAA
GTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGATG
ACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACCGA
AAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCTCG
GCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTGTG
CGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGTCC
ATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTTCA
ATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCTG

Sub-culture 22 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCT
GGCC

Sub-culture 33 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCT
GGCCC

Sub-culture 44 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT

CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCCTGGTACCT
GGCCC

Sub-culture 55 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TTCAAGGACTTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTC
AGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAAC
CTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGT
GGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTC
ATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCG
ACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGC
TTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGC
GGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGG
CTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGC
ACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCC
ATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTC
GAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGC
CTGGTACCTGGCCCA

Sub-culture 66 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGCCTGGTACCT
GGCC

Sub-culture 77 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG

TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCCTGGTACCT
GGCCCA

Sub-culture 88 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
AAGCGCTTCAGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTAC
TCGAAAAACCTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCC
GGTGAAGTGGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCT
GGTCAACTCATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTC
CGGTAGGCGACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTT
CACCGCGTGCTTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGG
CCTGTGGCGCGGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCG
GCATCGGCGGCTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTG
GCGTACGCGCACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGG
CAGTGAGTTCCATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTT
CATCGTTTCGTCGAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAG
GCCGCGCGCCTGGTACCTGGCCCA

Sub-culture 92 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
TTCAAGGACTTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTC
AGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAAC
CTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGT
GGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTC
ATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCG
ACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGC
TTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGC
GGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGG
CTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGC
ACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCC
ATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTC
GAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGC
CTGGTACCTGGCCCA

P.s. tomato DC3000 after 1 passage through tomato –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG

TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCCTGGTACCT
GGCGAG

P.s. tomato DC3000 after 2 passages through tomato –
TTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTT
ACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACC
GCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGCCTCAA
GGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGG
TCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGA
AAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGA
TGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACC
GAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCT
CGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTG
TGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGT
CCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTT
CAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCCTGGTACCT
GGCC

P. s. tomato DC3000 after 3 passages through tomato –
CATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTTACGCT
CAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACCGCCGA
AACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGCCTCAAGGACG
CGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGGTCGCC
CGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGAAAGTC
AACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGATGACC
GAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACCGAAAA
GCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCTCGGCC
CCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTGTGCGT
TGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGTCCATG
AAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTTCAATA
CCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCCTGGTACCTGG

P.s. tomato DC3000 after 4 passages through tomato –
CATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTTACGCT
CAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACCGCCGA
AACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGCCTCAAGGACG
CGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGGTCGCC
CGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGAAAGTC
AACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGATGACC
GAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACCGAAAA
GCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCTCGGCC
CCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTGTGCGT
TGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGTCCATG

AAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTTCAATA
CCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCCTGGTACCTGCC

P.s. tomato DC3000 after 5 passages through tomato –
CATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTTACGCT
CAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACCGCCGA
AACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAAGGACG
CGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGGTCGCC
CGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGAAAGTC
AACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGATGACC
GAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACCGAAAA
GCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCTCGGCC
CCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTGTGCGT
TGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGTCCATG
AAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTTCAATA
CCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCCTGGTACCTG

P.s. tomato DC3000 after 6 passages through tomato –
CATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTCAGCCAGTTTACGCT
CAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAACCTGATCACCGCCGA
AACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGTGGGCCTCAAGGACG
CGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTCATCCGAAGGTCGCC
CGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCGACAAGCTGAAAGTC
AACGGCGTCGATGTGATACCCGACGTTCACCGCGTGCTTAACCAGATGACC
GAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGCGGTTACACCGAAAA
GCCGATCACCGACGTGGTGAACATCGGCATCGGCGGCTCGTTCCTCGGCC
CCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGCACAAGGGTGTGCGT
TGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCCATGAACTGTCCATG
AAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTCGAAATCCTTCAATA
CCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCCTGGTACCTGGCC
CAG

P.s. tomato DC3000 after 7 passages through tomato –
TTCAAGGACTTCAGCATGCGCGAAGCGTTTACGGATGATCCCAAGCGCTTC
AGCCAGTTTACGCTCAGCAGCGCCGGTCTGTTTCTGGACTACTCGAAAAAC
CTGATCACCGCCGAAACCCGTGACCTGCTGGTTGCGCTGGCCGGTGAAGT
GGGCCTCAAGGACGCGATCAAGGCTCAATACTATGGCGAGCTGGTCAACTC
ATCCGAAGGTCGCCCGGCGCTGCACACCGCATTGCGTCGTCCGGTAGGCG
ACAAGCTGAAAGTCAACGGCGTCGATGTGATACCCGACGTTCACCGCGTGC
TTAACCAGATGACCGAGCTGGTCGGCCGCATCCACGACGGCCTGTGGCGC
GGTTACACCGAAAAGCCGATCACCGACGTGGTGAACATCGGCATCGGCGG
CTCGTTCCTCGGCCCCGAGCTGGTTTCCGAAGCGCTGGTGGCGTACGCGC
ACAAGGGTGTGCGTTGCCATTACCTGGCAAACATCGATGGCAGTGAGTTCC
ATGAACTGTCCATGAAGATCCGCGCCGAAACCACACTCTTCATCGTTTCGTC
GAAATCCTTCAATACCCTCGAAACCCTGAAAAATGCCCAGGCCGCGCGCGC
CTGGTACCTGGCCCA

RpoD Gene Sequences

Original culture of *P.s. tomato* DC3000 –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCTG

Sub-culture 11 of *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCTG

Sub-culture 22 of *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT

Sub-culture 33 of *P.s. tomato* DC3000 grown under optimum conditions –
CGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGCGC
ACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCACCA

GCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGAC
GACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAGC
CGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCGA
GCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCAG
CAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCTG
AAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCCTT
GCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCTGG
TAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCGCC
ATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTCCTG

Sub-culture 44 of *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCTG

Sub-culture 55 of *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
C

Sub-culture 66 of *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG

CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCTG

Sub-culture 77 of *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCTGC

Sub-culture 88 of *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCTGCGC

Sub-culture 92 of *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG

CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCTGCGC

Sub-culture 11 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGCGC
ACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCACCA
GCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGAC
GACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAGC
CGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCGA
GCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCAG
CAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCTG
AAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCCTT
GCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCTGG
TAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCGCC
ATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTCCTG

Sub-culture 22 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
AACGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGC
GCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCAC
CAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGA
CGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAG
CCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCG
AGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCA
GCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCT
GAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCC
TTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCT
GGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCG
CCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTCC
TGCG

Sub-culture 33 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
AATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGC
GCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCAC
CAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGA
CGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAG
CCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCG
AGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCA
GCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCT
GAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCC
TTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCT
GGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCG
CCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTCC
TG

Sub-culture 44 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGCG
CACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCACCA
GCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGAC
GACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAGC
CGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCGA
GCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCAG
CAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCTG
AAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCCTT
GCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCTGG
TAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCGCC
ATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCG

Sub-culture 55 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
AACGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGC
GCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCAC
CAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGA
CGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAG
CCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCG
AGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCA
GCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCT
GAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCC
TTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCT
GGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCG
CCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTC

Sub-culture 66 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGCGC
ACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCACCA
GCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGAC
GACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAGC
CGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCGA
GCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCAG
CAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCTG
AAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCCTT
GCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCTGG
TAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCGCC
ATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTC

Sub-culture 77 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
CGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGCGC
ACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCACCA
GCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGAC
GACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAGC
CGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCGA
GCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCAG

CAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCTG
AAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCCTT
GCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCTGG
TAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCGCC
ATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTC

Sub-culture 88 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
GGCGAGATCGAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGAT
GGGCGCAATTGCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATA
CACACGTGTCACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTA
TATCGACCCGGACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCG
TCGACCCCAAAGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAG
TCGGCAGACTCGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCC
GGTCATCGCCCAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCAC
CCGCAAGGCGCTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCG
AACTGGTTGCCCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACA
GTTTGAAGGTCTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGC
TCAGGAACGCGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCG
TGCCGACTTCCTGCGCC

Sub-culture 92 of *P.s. tomato* DC3000 grown under sub-optimum conditions –
TCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGCG
CACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCACCA
GCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGAC
GACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAGC
CGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCGA
GCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCAG
CAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCTG
AAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCCTT
GCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCTGG
TAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCGCC
ATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTCCTG
CGCCAGTTCCA

Original mutagenized culture of *P.s. tomato* DC3000 –
CGAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAAT
TGCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGT
CACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCC
GGACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCA
AAGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGAC
TCGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGC
CCAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGC
GCTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTG
CCCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGG
TCTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAAC

GCGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACT
TCCTGCG

Sub-culture 11 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
AAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTG
CGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCA
CCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGG
ACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAA
GCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTC
GAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCC
AGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGC
TGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCC
CTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTC
TGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGC
GCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT

Sub-culture 22 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT

Sub-culture 33 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCTGCGCC

Sub-culture 44 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCTGCGCC

Sub-culture 55 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
C

Sub-culture 66 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCT

Sub-culture 77 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
CCTGCGCCAGTTCC

Sub-culture 88 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
GAAACGAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGC
GCAATTGCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACA
CGTGTCACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATC
GACCCGGACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCG
ACCCCAAAGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCG
GCAGACTCGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGT
CATCGCCCAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCG
CAAGGCGCTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAAC
TGGTTGCCCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTT
TGAAGGTCTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCA
GGAACGCGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTG
CCGACTTCCTGCGCC

Sub-culture 92 of mutagenized *P.s. tomato* DC3000 grown under optimum conditions –
AAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTG
CGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCA
CCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGG
ACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAA
GCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTC
GAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCC
AGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGC
TGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCC
CTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTC
TGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGC
GCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTC
CTGCGC

P.s. tomato DC3000 after 1 passage through tomato –
GAACGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTG
CGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCA
CCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGG
ACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAA
GCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTC
GAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCC
AGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGC
TGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCC
CTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTC
TGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGC
GCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTC
CTGCG

P.s. tomato DC3000 after 2 passages through tomato –
CGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGCGC
ACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCACCA
GCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGAC
GACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAGC
CGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCGA
GCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCAG
CAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCTG
AAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCCTT
GCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCTGG
TAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCGCC
ATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTC

P.s. tomato DC3000 after 3 passages through tomato –
GAAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATT
GCGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTC
ACCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCG
GACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAA
AGCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACT
CGAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCC
CAGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCG
CTGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGC
CCTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGT
CTGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACG
CGCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTT
C

P.s. tomato DC3000 after 4 passages through tomato –
CCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTGCGCACT
TCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCACCAGCG
AAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGGACGACG
GCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAAGCCGTC

AAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTCGAGCGA
CGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCCAGCAGC
GTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGCTGAAGA
AGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCCCTTGCC
GAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTCTGGTAG
AGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGCGCCATC
ATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTCCTG

P.s. tomato DC3000 after 5 passages through tomato –
GAACGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTG
CGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCA
CCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGG
ACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAA
GCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTC
GAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCC
AGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGC
TGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCC
CTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTC
TGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGC
GCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTC

P.s. tomato DC3000 after 6 passages through tomato –
GAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTG
CGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCA
CCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGG
ACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAA
GCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTC
GAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCC
AGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGC
TGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCC
CTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTC
TGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGC
GCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTC
CTGCG

P.s. tomato DC3000 after 7 passages through tomato –
AAATCGCCAAGCGTATCGAAGAAGGCATCCGTGAAGTGATGGGCGCAATTG
CGCACTTCCCAGGCACGGTTGACCATATTCTCTCCGAATACACACGTGTCA
CCAGCGAAGGCGGTCGTCTCTCCGACGTTCTCAGCGGTTATATCGACCCGG
ACGACGGCATCGCGCCGCCTGCCGAAGTCCCTCCGCCCGTCGACCCCAAA
GCCGTCAAGGCCGAAGGCGCTGACGATGATGAGGAAGAGTCGGCAGACTC
GAGCGACGAAGAAGACGAAGTCGAAAGCGGTCCGGATCCGGTCATCGCCC
AGCAGCGTTTCGGTGCGGTTTCCGATCAAATGGAAATCACCCGCAAGGCGC
TGAAGAAGTTCGGTCGCGACGACAAGCACGCCATCGCCGAACTGGTTGCC
CTTGCCGAATTGTTCATGCCGATCAAACTGGTTCCAAAACAGTTTGAAGGTC
TGGTAGAGCGTGTCCGTGGTGCCCTCGAGCGTCTTCGTGCTCAGGAACGC

GCCATCATGCAGTTGTGCGTACGTGATGCACGTATGCCGCGTGCCGACTTC
CTGCG

VITA

Mindy M. James

Candidate for the Degree of

Doctor of Philosophy

Thesis: DEVELOPMENT AND VALIDATION OF A REAL-TIME PCR ASSAY FOR BIOFORENSIC DETECTION OF *PSEUDOMONAS SYRINGAE* PV. *TOMATO* AND EVALUATING THE IMPACTS OF STRESSORS ON THE EFFECTIVENESS OF MULTIPLE-LOCUS VAIABLE NUMBER TANDEM REPEAT ANALYSIS (MLVA) AND MULTILOCUS SEQUENCE TYPING (MLST) IN MICROBIAL FORENSICS INVESTIGATIONS

Major Field: Plant Pathology

Biographical:

Education:

Completed the requirements for the Doctor of Philosophy in Plant Pathology at Oklahoma State University, Stillwater, Oklahoma in December, 2012.

Completed the requirements for the Master of Science in Food Science at Oklahoma State University, Stillwater, Oklahoma in 2008.

Completed the requirements for the Bachelor of Science in Biology at Oklahoma State University, Stillwater, Oklahoma in 2004.

Experience:

Research assistant in the National Institute for Microbial Forensics & Food and Agricultural Biosecurity in the Department of Entomology & Plant Pathology at Oklahoma State University, 2009-present.

Research assistant in the Department of Animal Science at Oklahoma State University, 2005-2008.

Undergraduate lab technician in the Food and Agricultural Products Center at Oklahoma State University, 2005.

Professional Memberships:

American Phytopathological Society, Sigma Xi: The Scientific Research Society, The Honor Society of Phi Kappa Phi, Golden Key National Honour Society, Gamma Sigma Delta – The Honor Society of Agriculture

Name: Mindy M. James Date of Degree: December, 2012

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: DEVELOPMENT AND VALIDATION OF A REAL-TIME PCR ASSAY FOR BIOFORENSIC DETECTION OF *PSEUDOMONAS SYRINGAE* PV. *TOMATO* AND EVALUATING THE IMPACTS OF STRESSORS ON THE EFFECTIVENESS OF MULTIPLE-LOCUS VAIABLE NUMBER TANDEM REPEAT ANALYSIS (MLVA) AND MULTILOCUS SEQUENCE TYPING (MLST) IN MICROBIAL FORENSICS INVESTIGATIONS

Pages in Study: 209 Candidate for the Degree of Doctor of Philosophy

Major Field: Plant Pathology

Scope and Method of Study:

An assessment of U.S. natural security conducted after the anthrax mail attacks of 2001 suggested that the agricultural sector is vulnerable to bioterrorist threats. To prepare for investigation of such events, a national capability in microbial forensics and forensic plant pathology is needed. As part of this program forensic methods must be developed and validated for use with plant pathogens and environmental samples associated with agricultural settings. This work describes: (1) the development and rigorous validation of a real-time PCR assay for bioforensic detection of the model plant pathogen *Pseudomonas syringae* pv. *tomato*, and (2) evaluation of the ability of two common microbial strain-typing methods, multiple-locus VNTR analysis (MLVA) and multilocus sequence typing (MLST), to reliably type *P.s. tomato* that may have recently undergone evolution during repeated sub-culturing for one year *in planta* and under a variety of laboratory conditions.

Findings and Conclusions:

The *P.s. tomato* detection assay is highly reproducible, displays linear amplification of the target DNA from 10 ng to 10 fg, consistently detects 100 fg of target nucleic acid, and is specific to *P.s. tomato*. Linear amplification of the positive control plasmid was also observed. Results obtained during validation of the *P.s. tomato* assay provide a template for the development and validation of similar assays for plant pathogens of high consequence.

The MLVA fingerprints and MLST profiles from sub-cultured *P.s. tomato* DC3000 remained consistent throughout the experiment indicating that the selected genetic markers did not change over time. Thus, the specific MLVA and MLST typing systems used in this experiment should be reliable if used in a forensics investigation involving *P.s. tomato*.

Further research should be conducted in a field setting to ensure that the assays can reliably type *P.s. tomato* infecting plants in their natural environment. Additionally, for use in typing other high consequence plant pathogens care should be taken to ensure that stable genetic loci are chosen as certain pathogens may display faster rates of mutation than *P.s. tomato*.